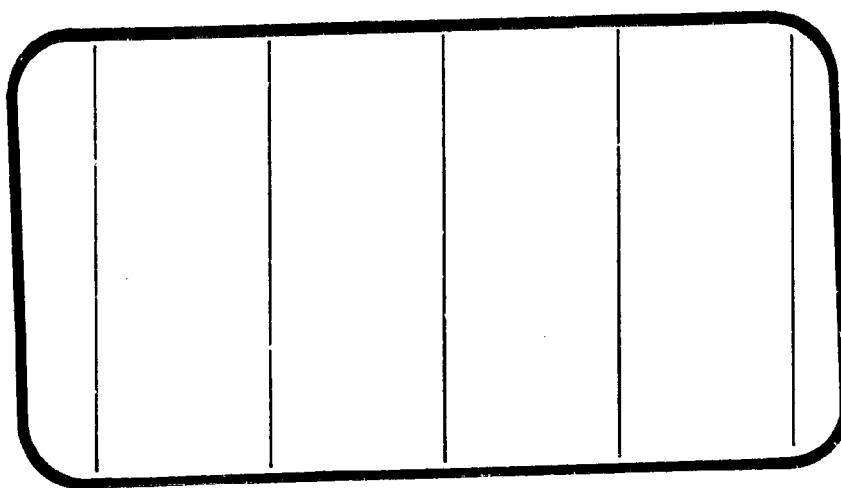




NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA CR-

134413



(NASA-CR-134413) WIND TUNNEL TESTS OF THE
0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE
(MODEL 52-25) IN THE NASA/AMES 3.5-FOOT
HYPERSONIC WIND TUNNEL (IA13) (Chrysler
Corp.) 115 p HC \$5.25

N75-19335

Unclass
14453

CSCL 22B G3/18

SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA Management services

SPACE DIVISION



CHRYSLER
CORPORATION

March, 1975

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WIND TUNNEL TESTS OF THE 0.010-SCALE
SPACE SHUTTLE INTEGRATED VEHICLE (MODEL 52-0T) IN
THE NASA/AMES 3.5-FOOT HYPERSONIC WIND TUNNEL
(IA18)

By

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Prepared under NASA Contract Number NAS9-13247

by

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Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number: ARC 3.5-191
NASA Series Number: IA18
Model Number: 52-0T
Test Dates: 9 through 12 April 1974 - Occupancy Hours: 62

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Chrysler Corporation Space Division assumes no responsibility for the data presented other than display characteristics.

WIND TUNNEL TESTS OF THE 0.010-SCALE
SPACE SHUTTLE INTEGRATED VEHICLE (MODEL 52-OT)
IN THE NASA/AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IA18)

By V. Esparza, E. Chee and J. Stone, Rockwell International Space Division
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ABSTRACT

Experimental aerodynamic investigations were conducted in the NASA/Ames Research Center 3.5-foot Hypersonic Wind Tunnel from April 9, 1974 to April 12, 1974 on an 0.010-scale model of the Space Shuttle Integrated Vehicle consisting of an orbiter and external tank (Model 52-OT).

The purpose of the test was to evaluate the basic hypersonic stability characteristics of the orbiter attached rigidly to the external tank and to evaluate the basic hypersonic stability characteristics of external tank alone simulating RTLS abort conditions. Test IA18 was conducted at Mach numbers of 5.3, 7.3 and 10.3.

The integrated vehicle was tested at angles of attack from -8° through $+30^\circ$ and angles of sideslip of -8° through $+8^\circ$ at fixed angles of attack of -4° , 0° , and $+4^\circ$. A maximum angle-of-attack range of $+15^\circ$ through $+40^\circ$ was obtained for this configuration, at Mach number 7.3, for one run only.

External tank alone testing was conducted at angles of attack from $+8^\circ$ through -30° and angles of sideslip of -8° through $+8^\circ$ at fixed angles of attack of -4° , 0° and $+4^\circ$.

Six-component force data and static base pressures were recorded during the test.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
INDEX OF MODEL FIGURES	2
INDEX OF DATA FIGURES	3
NOMENCLATURE	5
CONFIGURATIONS INVESTIGATED	9
TEST FACILITY DESCRIPTION	11
DATA REDUCTION	12
TABLES	
I. TEST CONDITIONS	14
II. DATASET/RUN NUMBER COLLATION SUMMARY	15
III. MODEL DIMENSIONAL DATA	16
FIGURES	
MODEL	42
DATA	51
APPENDIX	
TABULATED SOURCE DATA	

INDEX OF MODEL FIGURES

Figure		Page
1.	Axis Systems	42
2.	Model Sketches	
	a. Integrated Configuration - Og T20	43
	b. Orbiter - Og	44
	c. External Tank (T20) per R. I. Drawing VL78-000062B	45
	d. Base Pressure Orifice Locations	46
3.	Model Installation Photographs	
	a. Orbiter and Tank, Side View	47
	b. Orbiter and Tank, 3/4 Rear View	48
	c. Tank Only, Rolled 90° for Sideslip Run, 3/4 Rear View from Right Side	49
	d. Tank Only, Rolled 90° for Sideslip Run, Left Side View (Top of Model is toward Viewer)	50

INDEX OF DATA FIGURES

FIGURE NUMBER	TITLE	COEFFICIENT SCHEDULE	CONDITIONS VARYING	PLOT PAGES
4	Effect of Mach Number on Second Stage Longitudinal Aerodynamic Characteristics	A	MACH	1-12
5	Effect of Mach Number on Isolated ET Longitudinal Aerodynamic Characteristics	A	MACH	13-16
6	Effect of Angle of Attack on Second Stage Lateral-Directional Aerodynamic Characteristics	B	ALPHA	17-28
7	Effect of Angle of Attack on Isolated ET Lateral-Directional Aerodynamic Characteristics	H	ALPHA	29-37
8	Summary of Second Stage Longitudinal Aerodynamic Characteristics	C	MACH	38-38
9	Summary of Isolated ET Longitudinal Aerodynamic Characteristics	D	MACH	39-39
10	Summary of Second Stage Lateral-Directional Aerodynamic Characteristics	E	MACH, ALPHA	40-40
11	Summary of Isolated ET Lateral-Directional Aerodynamic Characteristics	F	MACH, ALPHA	41-41
12	Summary of Second Stage Longitudinal Characteristics With Beta Varying	G	MACH, BETA	42-44
13	Summary of Isolated ET Longitudinal Characteristics With Beta Varying	G	MACH, BETA	45-47

INDEX OF DATA FIGURES (Concluded)

COEFFICIENT SCHEDULE:

- (A): CAF, CN, CLM vs ALPHA,
CN vs CLM
- (B): CY, CYN, CBL vs BETA,
CY vs CYN
- (C): CAFAFO, CNAFO, CLMAFO, XAC/L vs MACH
- (D): CAFAFO, CLMAFO, XAC/L vs MACH
- (E): CYBETA, CBLBET, CYNBET, YAC/L vs MACH
- (F): CYBETA, CYNBET, YAC/L vs MACH
- (G): CAF, CN, CLM, XAC/L vs MACH
- (H): CY, CYN vs BETA
CY vs CYN

NOMENCLATURE General

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
a		speed of sound; m/sec, ft/sec
C _p	CP	pressure coefficient; $(p_1 - p_\infty)/q$
M	MACH	Mach number; V/a
P		pressure; N/m ² , psf
q	Q(NSM) Q(PSF)	dynamic pressure; $1/2\rho V^2$, N/m ² , psf
RN/L	RN/L	unit Reynolds number; per m, per ft
V		velocity; m/sec, ft/sec
α	ALPHA	angle of attack, degrees
β	BETA	angle of sideslip, degrees
ψ	PSI	angle of yaw, degrees
ϕ	PHI	angle of roll, degrees
ρ		mass density; kg/m ³ , slugs/ft ³

Reference & C.G. Definitions

A _b		base area; m ² , ft ²
b	BREF	wing span or reference span; ft
c.g.		center of gravity
\bar{l}_{REF}	LREF	reference length or wing mean aerodynamic chord; m, ft
S	SREF	wing area or reference area; m ² , ft ²
	MRP	moment reference point
	XMRF	moment reference point on X axis
	YMRF	moment reference point on Y axis
	ZMRF	moment reference point on Z axis

SUBSCRIPTS

b	base
l	local
s	static conditions
t	total conditions
∞	free stream

NOMENCLATURE (Continued)

Body-Axis System

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
C_N	CN	normal-force coefficient; $\frac{\text{normal force}}{qS}$
C_A	CA	axial-force coefficient; $\frac{\text{axial force}}{qS}$
C_Y	CY	side-force coefficient; $\frac{\text{side force}}{qS}$
C_{A_b}	CAB	base-force coefficient; $\frac{\text{base force}}{qS}$ $-A_b(p_b - p_\infty)/qS$
C_{A_f}	CAF	forebody axial force coefficient, $C_A - C_{A_b}$
C_m	CLM	pitching-moment coefficient; $\frac{\text{pitching moment}}{qS \bar{L}_{REF}}$
C_n	CYN	yawing-moment coefficient; $\frac{\text{yawing moment}}{qS b}$
C_l	CL	rolling-moment coefficient; $\frac{\text{rolling moment}}{qS b}$

Stability-Axis System

C_L	CL	lift coefficient; $\frac{\text{lift}}{qS}$
C_D	CD	drag coefficient; $\frac{\text{drag}}{qS}$
C_{D_b}	CDB	base-drag coefficient; $\frac{\text{base drag}}{qS}$
C_{D_f}	CDF	forebody drag coefficient; $C_D - C_{D_b}$
C_Y	CY	side-force coefficient; $\frac{\text{side force}}{qS}$
C_m	CLM	pitching-moment coefficient; $\frac{\text{pitching moment}}{qS \bar{L}_{REF}}$
C_n	CLN	yawing-moment coefficient; $\frac{\text{yawing moment}}{qS b}$
C_l	CL	rolling-moment coefficient; $\frac{\text{rolling moment}}{qS b}$
L/D	L/D	lift-to-drag ratio; C_L/C_D
L/D_f	L/Df	lift-to-forebody drag ratio; C_{L_f}/C_{D_f}

NOMENCLATURE (Continued)
Additions to Standard List

<u>Symbol</u>	<u>Plot Symbol</u>	<u>Definition</u>
A_i		model base area at station i , $i=1, \dots, 10$, in ²
C_{P1}		Orbiter OMS pod base pressure coefficient
C_{P3}		Orbiter base pressure coefficient
C_{P5}		external tank base pressure coefficient in the integrated configuration
C_{P6}		external tank base pressure coefficient
C_{P7}		external tank base pressure coefficient
C_{P10}		Orbiter balance cavity pressure coefficient
C_{P5}		external tank balance cavity pressure coefficient (tank alone)
C_{Ab0}	CAB-O	Orbiter base axial force coefficient
C_{AbOET}	CAB-T	external tank base axial-force coefficient in the integrated configuration
C_{AbET}	CAB-T	external tank base axial-force coefficient for tank alone
$(C_N)_{\alpha=0}$	CNAFO	normal-force coefficient at $\alpha=0$
$(C_m)_{\alpha=0}$	CLMAFO	pitching-moment coefficient at $\alpha=0$
$(C_{N\alpha})$	CNALFA	normal-force coefficient slope ($-5^\circ \leq \alpha \leq 5^\circ$)
$C_{m\alpha}$	CLMALF	pitching-moment coefficient slope ($-5^\circ \leq \alpha \leq 5^\circ$)
x_{mAC}/x_R	XAC/L	aerodynamic center, pitch ($-5^\circ \leq \alpha \leq 5^\circ$)

NOMENCLATURE (Concluded)
Additions to Standard List

<u>Symbol</u>	<u>Plot Symbol</u>	<u>Definition</u>
$C_{Y\beta}$	CYBETA	side-force coefficient slope ($-5^\circ \leq \beta \leq 5^\circ$)
C_{ℓ_β}	CBLBET	rolling-moment coefficient slope ($-5^\circ \leq \beta \leq 5^\circ$)
$C_{n\beta}$	CYNBET	yawing-moment coefficient slope ($-5^\circ \leq \beta \leq 5^\circ$)
x_{nAC}/ℓ_R	YAC/L	aerodynamic center, yaw ($-5^\circ \leq \beta \leq 5^\circ$)
$(C_{A_f})_{\alpha=0}$	CAFAFO	forebody axial force coefficient at $\alpha=0$

CONFIGURATIONS INVESTIGATED

The model for this test was an 0.010-scale representation of the Space Shuttle Integrated Configuration (model 52-0T). The model consisted of the orbiter and external tank. The model was constructed of stainless steel.

There were two configurations tested. The first configuration tested was the orbiter rigidly attached to the external tank. The second configuration tested was external tank alone. Model components tested were:

$O_9 = B_{19} C_7 E_{23} F_5 M_4 N_8 N_{24} R_5 V_7 W_{107}$

Orbiter

B_{19} = VL70-000139B (lines) body

C_7 = VL70-000139B (lines) canopy

E_{23} = VL70-000139B (lines) elevator

F_5 = VL70-000139B (lines) Bodyflap

M_4 = VL70-000139B (lines) OMS pod

N_8 = VL70-000140A (lines) OMS nozzle

N_{24} = VL70-000140A (lines) main engine nozzle

R_5 = VL70-000139B and VL70-000095 rudder

V_7 = VL70-000139B (lines) vertical tail

W_{107} = VL70-000139B (lines) wing

External Tank

T_{20} = VL78-000062B (lines) external tank

CONFIGURATIONS INVESTIGATED (Concluded)

AT₁₆ = VL78-000062B, SK-H-4011; forward Orbiter/ ET attach structure (when attached to Orbiter)

AT₁₇ = VL78-000062B, SK-H-4013; left rear Orbiter/ET attach structure

AT₁₈ = VL78-000062B, SK-H-4013; right rear Orbiter/ET attach structure

AT₁₉ = VL78-000062B, VL72-000140, VL72-000115; forward SRB/ET attach structure

AT₂₀ = VL78-000062B, VL72-000140, VL72-000115; Aft SRB/ET attach structure

AT₂₄ = VL78-000062B, forward Orbiter/ET attach structure (tank alone)

FL₅ = VL78-000062B, LOX feed line simulated between ET and Orbiter

FL₆ = VL78-000062B pressure line; max cross-sectional area simulating LH₂ pressure line and electrical conduit box on the ET.

FL₉ = VL78-000062B umbilical feedline

FR₆ = VL78-000062B VL78-000050 cross-members between ET/Orbiter attach structure

PT₁₂ = VL78-000062B lightning rod attached to ET

PT₁₃ = VL78-000062B ET protuberance simulation of LOX recirculation line and electrical conduit box

PT₁₄ = VL78-000062B ET protuberance simulation LOX pressure line

PT₁₉ = VL78-000062B SRB separation push off pad

PT₂₀ = VL78-000062B nose cone lines

TEST FACILITY DESCRIPTION

The NASA-Ames 3.5-Foot Hypersonic Wind Tunnel is a closed-circuit, blowdown-type tunnel capable of operating at nominal Mach numbers of 5, 7, and 10 at pressures to 1800 psia and temperatures to 3400°R for run times to four minutes. The major components of the facility include a gas storage system where the test gas is stored at 3000 psi, a storage heater filled with aluminum-oxide pebbles capable of heating the test gas to 3400°R, axisymmetric contoured nozzles with exit diameters of 42 inches for generating the desired Mach number, and a 900,000 ft³ vacuum storage system which operates to pressures of 0.3 psia. The test section itself is an open-jet type enclosed within a chamber approximately 12-feet in diameter and 40-feet in length, arranged transversally to the flow direction.

A model support system is provided that can pitch models through an angle-of-attack range of -20 to +20 degrees, in a vertical plane, about a fixed point of rotation on the tunnel centerline. This rotation point is adjustable from 1 to 5 feet from the nozzle exit plane. The model normally is out of the test stream (strut centerline 37-inches from tunnel centerline) until the tunnel test conditions are established after which it is inserted. Insertion time is adjustable to as little as 1/2 second and models may be inserted at any strut angle.

A high-speed, analog-to-digital data acquisition system is used to record test data on magnetic tape. The present system is equipped to measure and record the outputs from 80 transducers in addition to 20 channels of tunnel parameters.

DATA REDUCTION

The aerodynamic force data presented were measured by the Task 1.0-inch MK XIV strain gage balance and the moment data were transferred to the external tank centerline at a point 6.501 inches (model scale) aft of the tank nose.

Base pressure axial-force coefficients were calculated for the individual regions as follows:

1. Orbiter base axial-force coefficient:

$$C_{A_b} = - [A_1 C_{p_1} + A_3 C_{p_3} + A_{10} C_{p_{10}}] / S$$

$$\text{where: } A_1 = A_1 + A_2 = 2.64 \text{ in}^2$$

$$A_3 = A_3 + A_4 = 3.28 \text{ in}^2$$

$$A_{10} = 0.843 \text{ in}^2$$

2. External tank (when in the integrated configuration)

$$C_{A_b} = - [A_5 C_{p_5} + A_6 C_{p_6} + A_7 C_{p_7}] / S$$

$$\text{where: } A_5 = 1.767 \text{ in}^2$$

$$A_6 = 1.699 \text{ in}^2$$

$$A_7 = 5.097 \text{ in}^2$$

3. External tank (alone)

$$C_{A_b} = - [A_5 C_{p_5} + A_6 C_{p_6} + A_7 C_{p_7}] / S$$

$$\text{where: } A_5 = \text{sting cavity} = 1.109 \text{ in}^2$$

$$A_6 = 1.699 \text{ in}^2$$

$$A_7 = 5.097 \text{ in}^2$$

DATA REDUCTION (Concluded)

The following reference dimensions were used for data reduction:

<u>Symbol</u>	<u>Definition</u>	<u>Value</u> (model scale)
S	reference area	38.736 in ²
XMRP	longitudinal moment reference point	9.79 in
YMRP	moment reference point on Y axis	0.00 in
ZMRP	moment reference point on Z axis	4.00 in
l_R	reference length	12.903 in

The location of the base pressure orifices and their respective areas are shown in figure 2d.

TABLE 1.

[illegible]

TABLE II.

DATA SET/RUN NUMBER COLLATION SUMMARY										DATE: APRIL 11, 1974									
TEST: JAB-8 (ARG 3-E 141)																			
DATA SET IDENTIFIER	CONFIGURATION	SCHD. PARAMETERS/VALUES				NO. OF RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)										TEST RUN NUMBERS		
		A	B	C	D		5.3	7.3	10.3										
RES001	CRBITER + TANK	A	C	C	R		19	18	1										
22		+4	B				22	16	3										
23		C	B				21	14	2										
24		+4	B				23	15	4										
25		C	C					17											
26	TANK	D	C				26	9	8										
27		+4	B					11	6										
28		C	B				25	13	7										
29		+4	B				27	12	5										
RES002	CRBITER + TANK	O	B	C	C		20												
31		A	O				19												
32	TANK	D	C				26												

NOTES: *R* D/S ARE CORRECTED FOR CAB EFFECTS AT MACH 5.3 ONLY: CAB CONSIDERED NEGLIGIBLE FOR REMAINDER OF MACH RANGE.
 X D/S CONTAIN DATA (CAB-O, CAB-T) USED TO CORRECT AXIAL FORCE AND PITCHING MOMENT (MATED CONFIG.) COEFFICIENTS
 AT MACH 5.3. XES010 USED TO CORRECT RES002-004, XES001 USED TO CORRECT RES001, AND XES006 USED TO CORRECT RES006
 AND RES008-009. XES006 IS ALPHA SWEEP DATA BUT WAS USED TO CORRECT BOTH α AND β SWEEP DATA DUE TO TANK SYMMETRY.

COEFFICIENT SCHEDULES

COEFFICIENT SCHEDULES

TYPE OF DATA

α OR β

RES-001-005

RES-001-005

RES-001-005

RES-001-005

RES-001-005

RES-001-005

RES-001-005

RES-001-005

RES-001-005

RES-001-005

TABLE III. - MODEL DIMENSIONAL DATA

MODEL COMPONENT : BODY - B19

GENERAL DESCRIPTION : FUSELAGE per Rockwell Lines VL70-000139B

SCALE: 0.010

DRAWING NUMBER VL70-000139B

DIMENSIONS	FULL SCALE	MODEL SCALE
Length - In.	<u>1290.3</u>	<u>12.903</u>
Max Width - In.	<u>267.6</u>	<u>2.676</u>
Max Depth - In.	<u>244.5</u>	<u>2.445</u>
Fineness Ratio	<u>4.82175</u>	<u>4.82175</u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u>386.67</u>	<u>0.0387</u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : CANOPY - C7

GENERAL DESCRIPTION : Basic configuration 3A canopy

MODEL SCALE: 0.010

DRAWING NUMBER VL70-000139B

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length ($X_0=433$ to $X_0=670$) in.FS	<u>237.</u>	<u>2.370</u>
Max Width	<u> </u>	<u> </u>
Max Depth	<u> </u>	<u> </u>
Fineness Ratio	<u> </u>	<u> </u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ELEVON - E₂₃

GENERAL DESCRIPTION: Configuration 3 per W107 Rockwell Lines

VL70-000139B, data for (1) of (2) sides.

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-000139B

<u>DIMENSIONS:</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area - FT ²	<u>205.52</u>	<u>0.0206</u>
Span (equivalent) - In.	<u>353.34</u>	<u>3.533</u>
Inb'd equivalent chord - In.	<u>114.78</u>	<u>1.148</u>
Outb'd equivalent chord - In.	<u>55.00</u>	<u>0.550</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.208</u>	<u>0.208</u>
At Outb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
Sweep Back Angles, degrees		
Leading Edge	<u>0.00</u>	<u>0.00</u>
Trailing Edge	<u>- 10.24</u>	<u>-10.24</u>
Hingeline	<u>0.00</u>	<u>0.00</u>
Area Moment (Normal to hinge line)	<u>1548.07</u>	<u>0.00155</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : BODY FLAP - F₅

GENERAL DESCRIPTION : Configuration 3 - A lightweight orbiter body
flap

MODEL SCALE: 0.010 MODEL DRAWING NO.: SS-A00062

DRAWING NUMBER VL70-000139B

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length - In.	<u>84.70</u>	<u>0.8470</u>
Max Width - In.	<u>267.6</u>	<u>2.6760</u>
Max Depth	<u> </u>	<u> </u>
Fineness Ratio	<u> </u>	<u> </u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u>142.5195</u>	<u>0.01425</u>
Planform	<u> </u>	<u> </u>
Wetted	<u>38.0958</u>	<u>0.00381</u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : OMS - M₄

GENERAL DESCRIPTION : Orbital maneuvering system pods located on
th orbiter aft fuselage

MODEL SCALE: 0.010

DRAWING NUMBER VL70-000139

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length - In.	<u>346.0</u>	<u>3.460</u>
Max Width - In.	<u>108.0</u>	<u>1.080</u>
Max Depth - In.	<u>113.0</u>	<u>1.113</u>
Fineness Ratio	<u> </u>	<u> </u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

Centerline of OMS Pods:

WP = 463.9 IN FS: WP = 400 + 63.9 = 463.9

BP = 80.0 IN F.S.

Length: 1214.0 to 1560.0 = 346.0 IN. F.S.

NOTE: M₄ identical to M of 2A configuration except intersection to body.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: MP3 NOZZLES - N8GENERAL DESCRIPTION: Basic OMS Nozzle of Configuration 2A per RockwellLines VL70-008306 and VL70-000089"B". Intersection of nozzleexit plane and nozzle centerline at $X_0 = 1570.75$, $Y_0 = \pm 99.25$, $Z_0 = 507.25$ MODEL SCALE: 0.010DRAWING NUMBER: VL70-008306, VL70-00089"B", SS-A00092

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
MACH NO.		
Length - In.		
Gimbal Point to Exit Plane		
Throat to Exit Plane		
Diameter - In.		
Exit	<u>50.00</u>	<u>0.50</u>
Throat	<u>N/A</u>	<u>N/A</u>
Inlet	<u>28.00</u>	<u>0.280</u>
Area - ft ²		
Exit	<u>13.635</u>	<u>0.1364</u>
Throat		
Gimbal Point (Station) - In.		
Upper Nozzle		
X	<u>1518.0</u>	<u>15.18</u>
Y	<u>+ 88.0</u>	<u>+ 0.88</u>
Z	<u>492.0</u>	<u>4.92</u>
Lower Nozzles		
X		
Y		
Z		
Null Position - Deg.		
Upper Nozzle		
Pitch	<u>15049'</u>	<u>15049'</u>
Yaw (Outboard)	<u>+ 12017'</u>	<u>+ 12017'</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: MPS NOZZLES - N 24GENERAL DESCRIPTION: Configuration 140A/B Orbiter MPS NozzlesMODEL SCALE: 0.010DRAWING NUMBER: VL70-005030A, VL70-000140A

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
MACH NO.		
Length - In.		
Gimbal Point to Exit Plane	<u>157.0</u>	<u>1.570</u>
Throat to Exit Plane	<u>99.2</u>	<u>0.992</u>
Diameter - In.		
Exit	<u>91.000</u>	<u>0.910</u>
Throat	<u> </u>	<u> </u>
Inlet	<u> </u>	<u> </u>
Area - ft ²		
Exit	<u>45.16585</u>	<u>0.00452</u>
Throat	<u> </u>	<u> </u>
Gimbal Point (Station) - In.		
Upper Nozzle		
X	<u>1445.0</u>	<u>14.450</u>
Y	<u>0</u>	<u>0</u>
Z	<u>443.0</u>	<u>4.430</u>
Lower Nozzles		
X	<u>1468.16996</u>	<u>0.00147</u>
Y	<u>+ 53.0000</u>	<u>0.530</u>
Z	<u>- 342.63988</u>	<u>3.426</u>
Null Position - Deg.		
Upper Nozzle		
Pitch	<u>16°</u>	<u>16°</u>
Yaw	<u>0°</u>	<u>0°</u>
Lower Nozzle		
Pitch	<u>10°</u>	<u>10°</u>
Yaw	<u>3.5°</u>	<u>3.5°</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT:

RUDDER - R₅

GENERAL DESCRIPTION:

Rudder for vertical stabilizer V₇MODEL SCALE: 0.010DRAWING NUMBER:VL70-000095DIMENSIONS:FULL-SCALEMODEL SCALEArea - Ft²100.150.0100

Span (equivalent) - In.

201.02.010

Inb'd equivalent chord - In.

91.5850.916

Outb'd equivalent chord - In.

50.8330.508Ratio movable surface chord/
total surface chord

At Inb'd equiv. chord

0.4000.400

At Outb'd equiv. chord

0.4000.400

Sweep Back Angles, degrees

Leading Edge

34.8334.83

Tailing Edge

26.2526.25

Hingeline

34.8334.83Area Moment (Normal to hinge line) Ft³526.1250.0005261

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: VERTICAL - V₇GENERAL DESCRIPTION: Centerline vertical tail, double-wedge airfoil
with rounded leading edge.NOTE: Same As V₅, but with manipulator housing removed.MODEL SCALE: 0.010DRAWING NUMBER: VL70-000139

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
TOTAL DATA		
Area (Theo) - Ft ²		
Planform	<u>425.92</u>	<u>0.0426</u>
Span (Theo) - In.	<u>315.72</u>	<u>3.157</u>
Aspect Ratio	<u>1.675</u>	<u>1.675</u>
Rate of Taper	<u>0.507</u>	<u>0.507</u>
Taper Ratio	<u>0.404</u>	<u>0.404</u>
Sweep-Back Angles, Degrees.		
Leading Edge	<u>45.000</u>	<u>45.000</u>
Trailing Edge	<u>26.249</u>	<u>26.249</u>
0.25 Element Line	<u>41.130</u>	<u>41.130</u>
Chords:		
Root (Theo) WP	<u>268.50</u>	<u>2.685</u>
Tip (Theo) WP	<u>108.47</u>	<u>1.085</u>
MAC	<u>199.81</u>	<u>1.998</u>
Fus. Sta. of .25 MAC	<u>1463.50</u>	<u>14.635</u>
W.P. of .25 MAC	<u>635.522</u>	<u>6.355</u>
B.L. of .25 MAC	<u>0.00</u>	<u>0.00</u>
Airfoil Section		
Leading Wedge Angle - Deg.	<u>10.000</u>	<u>10.000</u>
Trailing Wedge Angle - Deg.	<u>14.920</u>	<u>14.920</u>
Leading Edge Radius	<u>2.0</u>	<u>2.0</u>
Void Area	<u>13.17</u>	<u>0.1317</u>
Blanketed Area	<u>0.00</u>	<u>0.00</u>

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TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: WING-W 107

GENERAL DESCRIPTION: Configuration 3 per Rockwell Lines VL70-000139B

NOTE: Same as W₁₀₃, except cuff, airfoil and incidence angle.

MODEL SCALE: 0.010

TEST NO.

DWG. NO. VL70-000139B

DIMENSIONS:

FULL-SCALE

MODEL SCALE

TOTAL DATA

Area (Theo.) Ft²

Planform

Span (Theo) In.

Aspect Ratio

Rate of Taper

Taper Ratio

Dihedral Angle, degrees

Incidence Angle, degrees

Aerodynamic Twist, degrees

Sweep Back Angles, degrees

Leading Edge

Trailing Edge

0.25 Element Line

Chords:

Root (Theo) B.P.O.O.

Tip, (Theo) B.P.

MAC

Fus. Sta. of .25 MAC

W.P. of .25 MAC

B.L. of .25 MAC

EXPOSED DATA

Area (Theo.) Ft²

Span, (Theo) In. BP108

Aspect Ratio

Taper Ratio

Chords

Root BP108

Tip $1.00 \frac{b}{2}$

MAC

Fus. Sta. of .25 MAC

W.P. of .25 MAC

B.L. of .25 MAC

Airfoil Section (Rockwell Mod NASA)

XXXX-64

Root $\frac{b}{2}$

Tip $\frac{b}{2}$

Data for (1) of (2) Sides

Leading Edge Cuff

Leading Edge Cuff

Leading Edge Cuff Intersect Fus M. L. @ Sta

Leading Edge Cuff Intersect Wing M. L. @ Sta

TABLE III.- MODEL DIMENSIONAL DATA- Continued.

MODEL COMPONENT: EXTERNAL TANK - T₂₀

GENERAL DESCRIPTION: External Oxygen Hydrogen Tank

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000062 , VL72-000131

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Length (In.) (Nose @ $X_0 = 328.92$)	<u>1846.905</u>	<u>18.469</u>
Max. Width - Dia - In. (@ $X_0 = 975.675$)	<u>333.2</u>	<u>3.332</u>
Major Dia - In.	<u>330.2</u>	<u>3.302</u>
Max. Depth:	<u> </u>	<u> </u>
Fineness Ratio	<u>5.65713</u>	<u>5.6571</u>
Area - Ft ²		
Max. Cross-sectional @ $X_0 = 975.675$	<u>605.534</u>	<u>0.0605</u>
Major cross-sectional	<u>594.679</u>	<u>0.0595</u>
Base (based on 330.2 dia)	<u>594.679</u>	<u>0.0595</u>
WP of Tank Centerline (Z) -In.	<u>400.0</u>	<u>4.00</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₆

GENERAL DESCRIPTION: Forward orbiter/ET Attach Structure (2 member Structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, SK-H-4011

MODEL DRAWING: SS-AG0117

DIMENSIONS:	<u>MEMBER</u>		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
	#1	X _O	394.38	3.944
		Y _O	0	0
		Z _O	LWR ML	LWR ML
		X _T	1131.0	11.310
		Y _T	46.8	0.468
		Z _T	561.298	5.613
	#2	X _O	394.38	3.944
		Y _O	0	0
		Z _O	LWR ML	LWR ML
		X _T	1131.0	11.310
		Y _T	- 46.8	- 0.468
		Z _T	561.298	5.613

Diameter of Members: 5.70 IN. DIA., F.S.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₇

GENERAL DESCRIPTION: Left rear orbiter/ET attach structure (2 member structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, SK-H-4013.

MODEL DRAWING: SS-A00117

DIMENSIONS:	MEMBER		FULL SCALE	MODEL SCALE
#	#1	X _O	1317	13.17
		Y _O	- 96.5	- 0.965
		Z _O	267.5	2.675
		X _T	2058.0	20.58
		Y _T	- 125.827	1.258
		Z _T	515.5	5.155
	#2	X _O	1317.0	13.17
		Y _O	- 96.5	- 0.965
		Z _O	267.5	2.675
		X _T	2058.0	20.58
		Y _T	- 125.827	1.258
		Z _T	515.5	5.155

Diameter of Members: #1 11.5 In. Dia. F.S.

#2 15.5 In. Dia. F.S.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₈

GENERAL DESCRIPTION: Right rear orbiter/ET attach structure (3 member structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, SK-II-4013

MODEL DRAWING: SS-A00117

DIMENSIONS:	MEMBER		FULL SCALE	MODEL SCALE
	#1	X _O	1317.00	13.170
		Y _O	+ 96.5	+ 0.965
		Z _O	267.5	2.675
		X _T	1872.0	18.720
		Y _T	+ 125.827	+ 1.258
		Z _T	515.5	5.155
	#2	X _O	1317.0	13.170
		Y _O	+ 96.5	+ 0.965
		Z _O	267.5	2.675
		X _T	2058.0	20.580
		Y _T	+ 125.827	+ 1.258
		Z _T	515.5	5.155
	#3	X _O	1317.0	13.170
		Y _O	54.40	0.544
		Z _O	19.30	0.193
		X _T	2058.0	20.580
		Y _T	2.5	0.025
		Z _T	567.6	5.676
Diameter of Members: (In.)	#1		15.5	0.155
	#2		11.5	0.115
	#3		4.5	0.045

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₉

GENERAL DESCRIPTION: Forward SRB/ET attach structure (2 attach structures - Left and Right).

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, VL72-000140, VL72-000115 MODEL DRAWING: SS-A00117

DIMENSIONS:	FRONTAL VIEW	<u>MEMBER - LEFT</u>	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
		X _B		
		Y _B		
		Z _B		
		X _T	975.675	9.757
		Y _T	166.67	+ 1.667
		Z _T	+566.5	+ 5.665
		<u>MEMBER - RIGHT</u>		
		X _B		
		Y _B		
		B _B		
		X _T	975.675	9.757
		Y _T	166.67	1.667
		Z _T	- 233.5	- 2.335

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE- AT₂₀

GENERAL DESCRIPTION: Att SRB/ET attach structure (3 member structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, VL72-000140, VL72-000115 MODEL DWG: SS-A00117

DIMENSIONS:	MEMBER		FULL SCALE	MODEL SCALE
	#1	X _B	1317.0	13.17
		Y _B	± 57.0	0.570
		Z _B		
		Z _T	457.0	4.570
	#2	X _B	1317.0	13.17
		X _T	2058.0	20.580
	#3	X _B	1317.0	13.170
		Y _B	± 57.0	± 0.570
		X _T	2058.0	20.580
		Z _T	343.0	3.430
Diameter of Members: -(In.)			6.0	0.060

TABLE III. - MODEL DIMENSIONAL DATA - Concluded.

MODEL COMPONENT: ATTACH STRUCTURE - AT₂₄

GENERAL DESCRIPTION: Forward orbiter/ET attach structure (2 member structure) simulating the attach structure after ET separation.

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000062B

MODEL DRAWING: SS-A00117

DIMENSIONS:	<u>MEMBER</u>		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
	#1	X _O	346.00	3.460
		Y _O	0	0
		Z _O	280.07	2.800
		X _T	1131.00	11.310
		Y _T	46.0	0.460
		Z _T	565.07	5.650
	#2	X _O	346.00	3.460
		Y _O	0	0
		Z _O	280.07	2.800
		X _T	1131.00	11.310
		Y _T	- 46.00	- 0.460
		Z _T	280.07	2.800
Diameters of Members: (In.)			5.70	0.057

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: FEEDLINE - FL₅

GENERAL DESCRIPTION: LOX Feed line simulated between ET and Orbiter.

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B,

MODEL DRAWING: SS-A00117

DIMENSIONS:

		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at:	X _T	1033.3	10.333
	Y _T	70.0	0.700
	X _T	1033.3	10.333
	Y _T	- 70.0	- 0.700
Trailing edge at:	X _T	2071.50	20.715
	Y _T	70.00	0.700
	Dia. - Inches.	18.80	0.188
	X _T	2071.50	20.715
	Y _T	+ 70.00	+ 0.700

Centerline of LOX Feedline located radially at $\phi = 23^{\circ}24'$

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: PRESSURE LINE - FL6

GENERAL DESCRIPTION: Max. cross-sectional area simulating LH₂ pressure line and electrical conduit box between ET and Orbiter.

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING NO.: SS-A00117

DIMENSIONS:

	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at: X_T	1127.1	11.271
Y_T	110.3	1.103
Trailing edge at: X_T	2062.1	20.621
Y_T	110.3	1.103

Centerline of LH₂ pressure line located radially at $\phi = 33^{\circ}45'$

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : LH₂ UMBILICAL FEEDLINE - FL₂

GENERAL DESCRIPTION : LH₂ Umbilical Feedline with an electrical quick disconnect box between the Orbiter and ET.

MODEL SCALE: 0.010

DRAWING NUMBER : VL78-0000628

DIMENSIONS	FULL SCALE	MODEL SCALE
Centerline at X _T	<u>2071.5</u>	<u>20.715</u>
Max Width	<u>32.2</u>	<u>0.312</u>
Max Depth	<u>37.5</u>	<u>0.375</u>
Diameter	<u>17.0</u>	<u>0.170</u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: FAIRING - FR₆

DESCRIPTION: Cross member between aft ET/orbiter attach structures

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, VL78-000050 MODEL DRAWING: SS-A00117

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at X _T	2035.50	20.355
Length	15.00	0.150
Width	193.0	1.930

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ET PROTUBERANCE - PT₁₂

GENERAL DESCRIPTION: Lightning rod attached to ET nose.

MODEL SCALE. 0.010

DRAWING NO.: VL78-000068B

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Length	30.90	0.309
Diameter - In.	3.20	0.032

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ET PROTUBERANCE - PT₁₃

GENERAL DESCRIPTION: Maximum cross-sectional area simulating LOX recirculation line and electrical conduit box on planform view of external tank, T₂₀.

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING: SS-A00117

DIMENSIONS:

		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at:	X _T	1208.3	12.083
	Y _T	+ 95.0	+ 0.950
	X _T	1208.3	12.083
	Y _T	- 95.0	- 0.950
Trailing edge at:	X _T	2060.5	20.605
	Y _T	+ 95.0	+ 0.950
	X _T	2060.5	20.605
	Y _T	- 95.0	- 0.950

Centerline of LOX recirculation line located radially at $\phi = 33^{\circ}45'$.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ET PROTUBERANCE - PT₁₄

GENERAL DESCRIPTION: LOX pressure line on Tank T₂₀

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING:

DIMENSIONS:

		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at:	X _T	355.90	3.559
	Y _T	6.0	0.06
Trailing edge at:	X _T	2060.5	20.605
	Y _T	+ 87.0	+ 0.870

Centerline of LOX pressure line located radially at $\phi = 23^{\circ}24'$.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: SRB SEPARATION PUSH-OFF PAD - PT₁₉

GENERAL DESCRIPTION: Forward ET/SRB Separation pads (push-off pads)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING: SS-A00117

DIMENSIONS:	MEMBER		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
	#1	X _T	450.0	4.50
		Y _T	975.60	9.756
		Z _T	166.50	1.665
	#2	X _T	450.00	4.500
		Y _T	- 975.60	9.756
		Z _T	166.50	1.665

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT NOSE CONE LINES - PT₂₀

GENERAL DESCRIPTION Maximum cross-sectional area simulating the
LOX pressure line and electrical conduit on top of external tank
(T₂₀) nose cone area.

MODEL SCALE: 0.010

DRAWING NUMBER VL78-000062B

DIMENSIONS	FULL SCALE	MODEL SCALE
Leading Edge at: X _T	<u>360.92</u>	<u>3.609</u>
Y _T	<u>34.0</u>	<u>0.340</u>
Trailing Edge at: X _T	<u>955.1</u>	<u>9.551</u>
Y _T	<u>336.5</u>	<u>3.365</u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>
Centerline of lines located radially at $\phi = 33^{\circ}45'$		

Notes:

1. Positive directions of force coefficients, moment coefficients, and angles are indicated by arrows
2. For clarity, origins of wind and stability axes have been displaced from the center of gravity

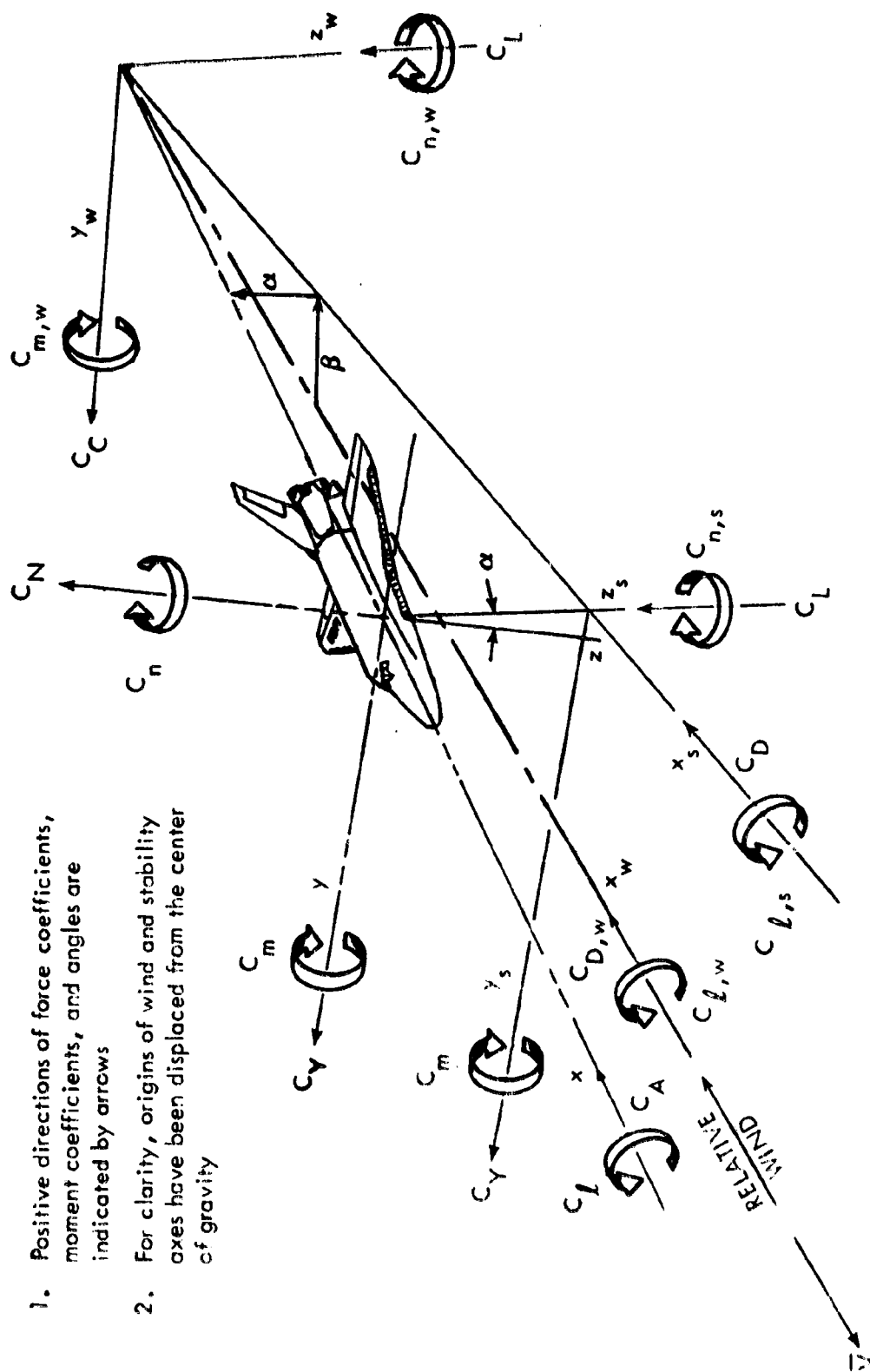
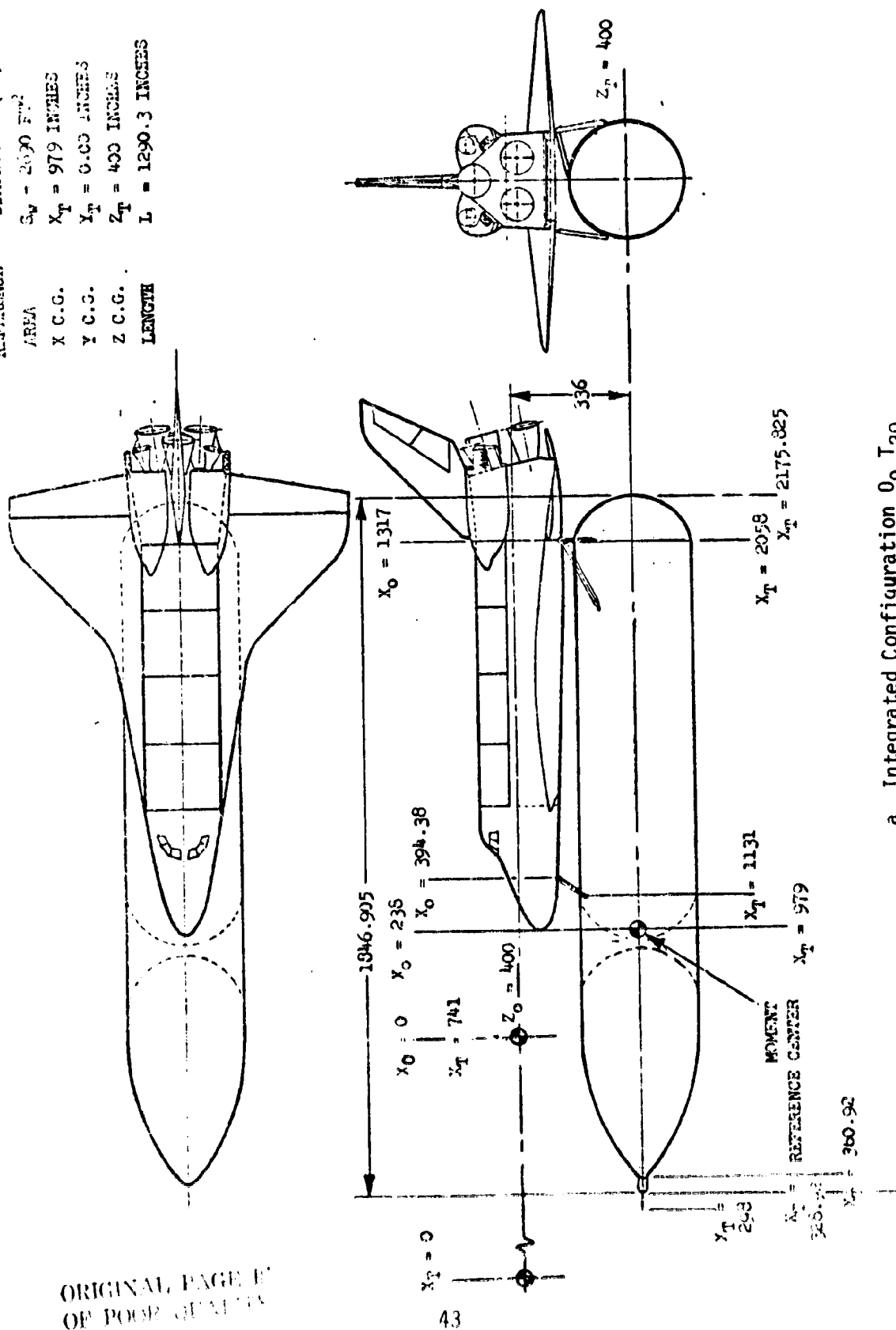


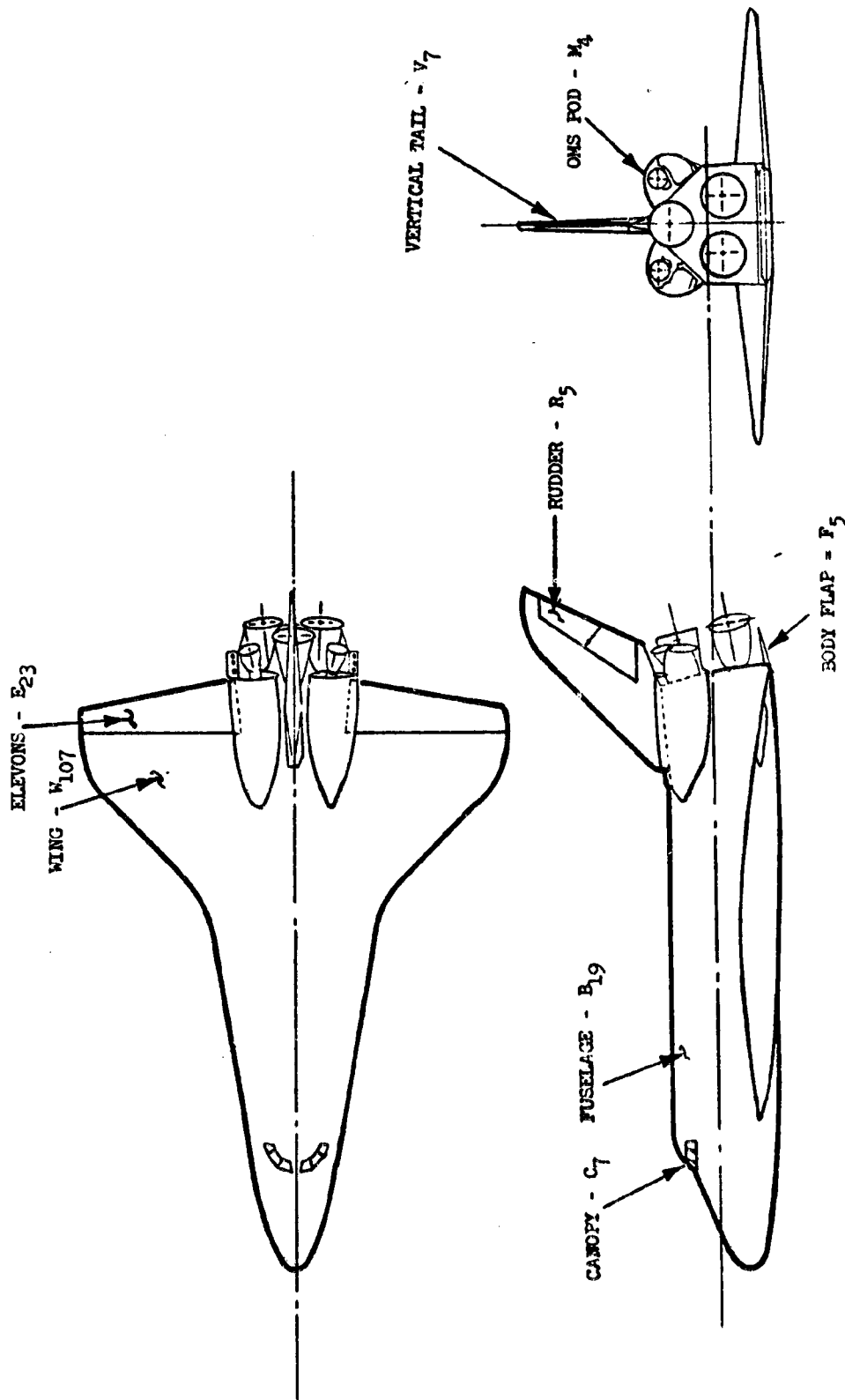
Figure 1. - Axis Systems.

REFERENCE	DIMENSION (IN)
AREA	$S_V = 2090 \text{ FT}^2$
X C.G.	$X_T = 979 \text{ INCHES}$
Y C.G.	$Y_T = 0.00 \text{ INCHES}$
Z C.G.	$Z_T = 400 \text{ INCHES}$
LENGTH	$L = 1290.3 \text{ INCHES}$



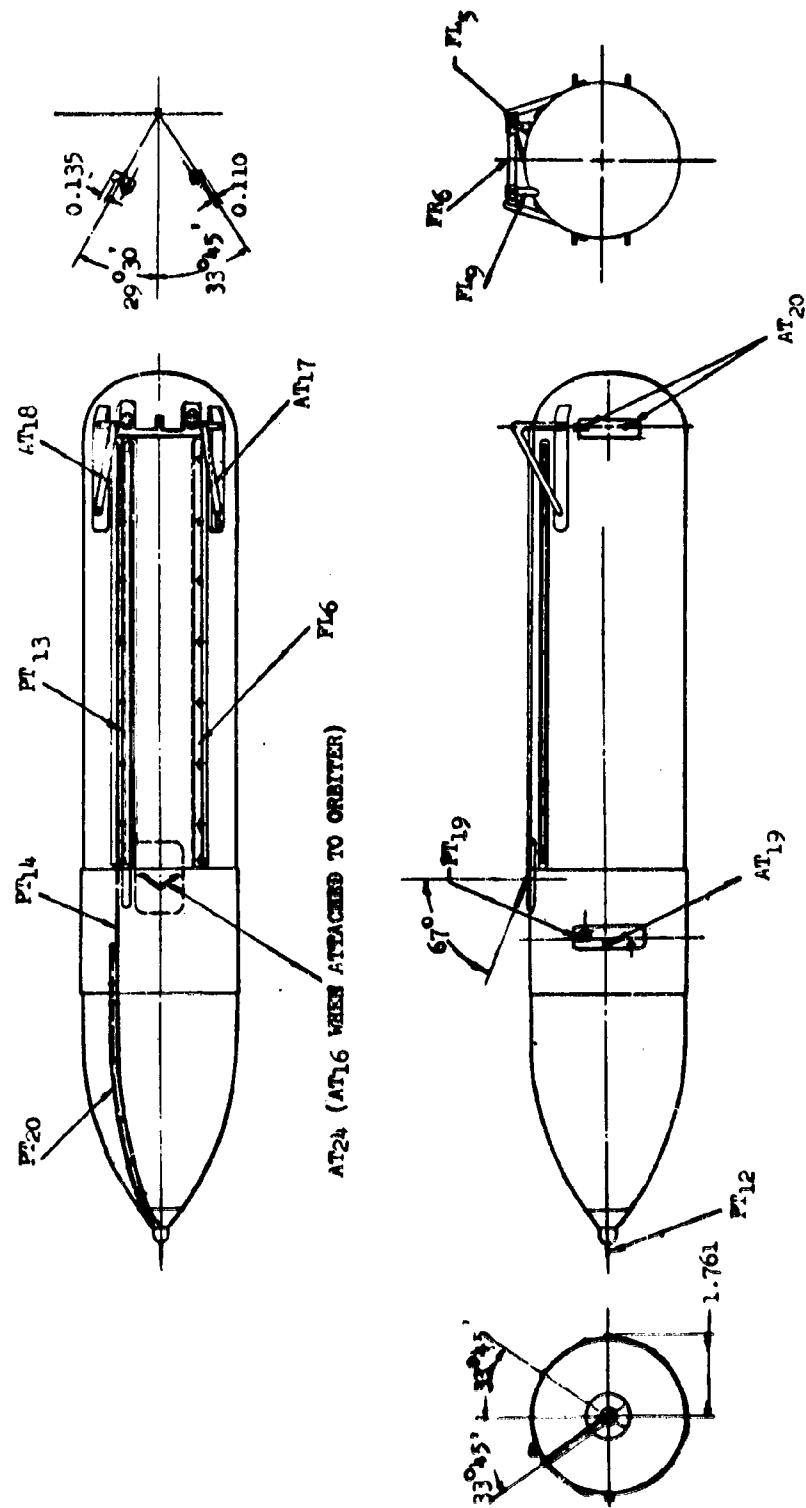
a. Integrated Configuration $O_g T_{20}$

Figure 2. - Model sketches.

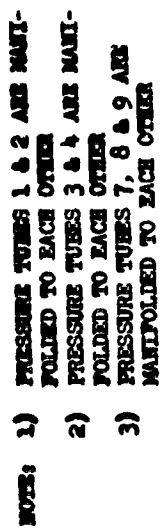


b. Orbiter - 09

Figure 2. - Continued.



c. External Tank (T20) per R. 1. Drawing VL78-000062B
Figure 2. - Continued.



d. Base Pressure Orifice Locations

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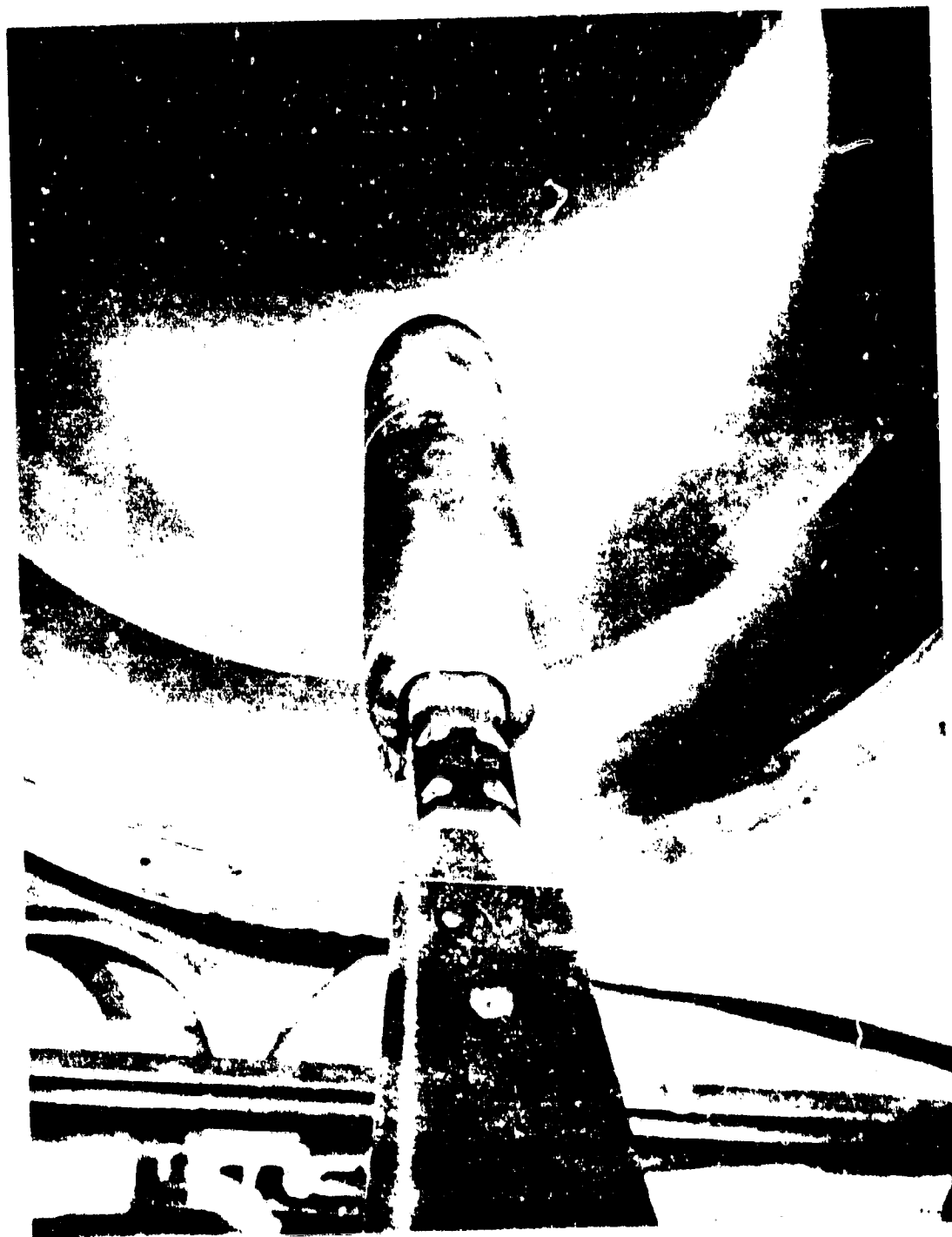
a. Orbiter and Tank, Side View

Figure 3. - Model installation photographs.

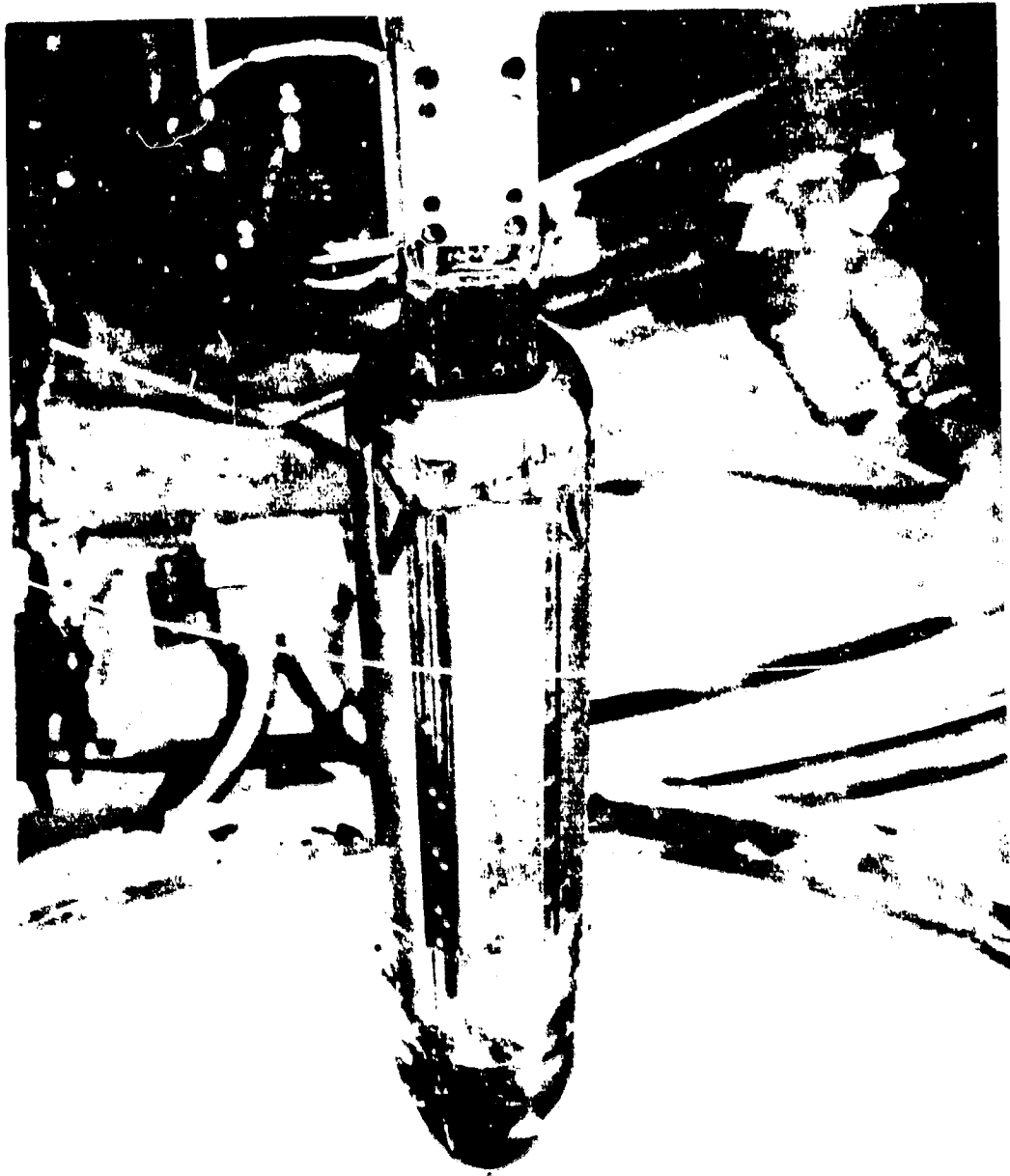


b. Orbiter and Tank, 3/4 Rear View

Figure 3. - Continued.



c. Tank Only, Rolled 90° for Sideslip Run, 3/4 Rear View from Right Side
Figure 3. - Continued.



c. Tank Only, Rolled 90° for Sideslip Run, Left Side View (Top of Model is Toward Viewer)
Figure 3. - Concluded.

DATA FIGURES

DATA S. 1 SIMC
 (2) SC01 (1)
 (2) SC03
 CONFIGURATION DESCRIPTION
 DATA - ARC 3.5 (9) - ORBITER + TANK
 DATA NOT AVAILABLE

BETA .000
 .000
 .000
 RUDDER .000
 .000
 .000
 ELEVON .000
 .000
 .000

REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 LREF 2690.0000
 BREF 2690.0000
 VREF 979.0000
 WREF 400.0000
 SCALE .0000

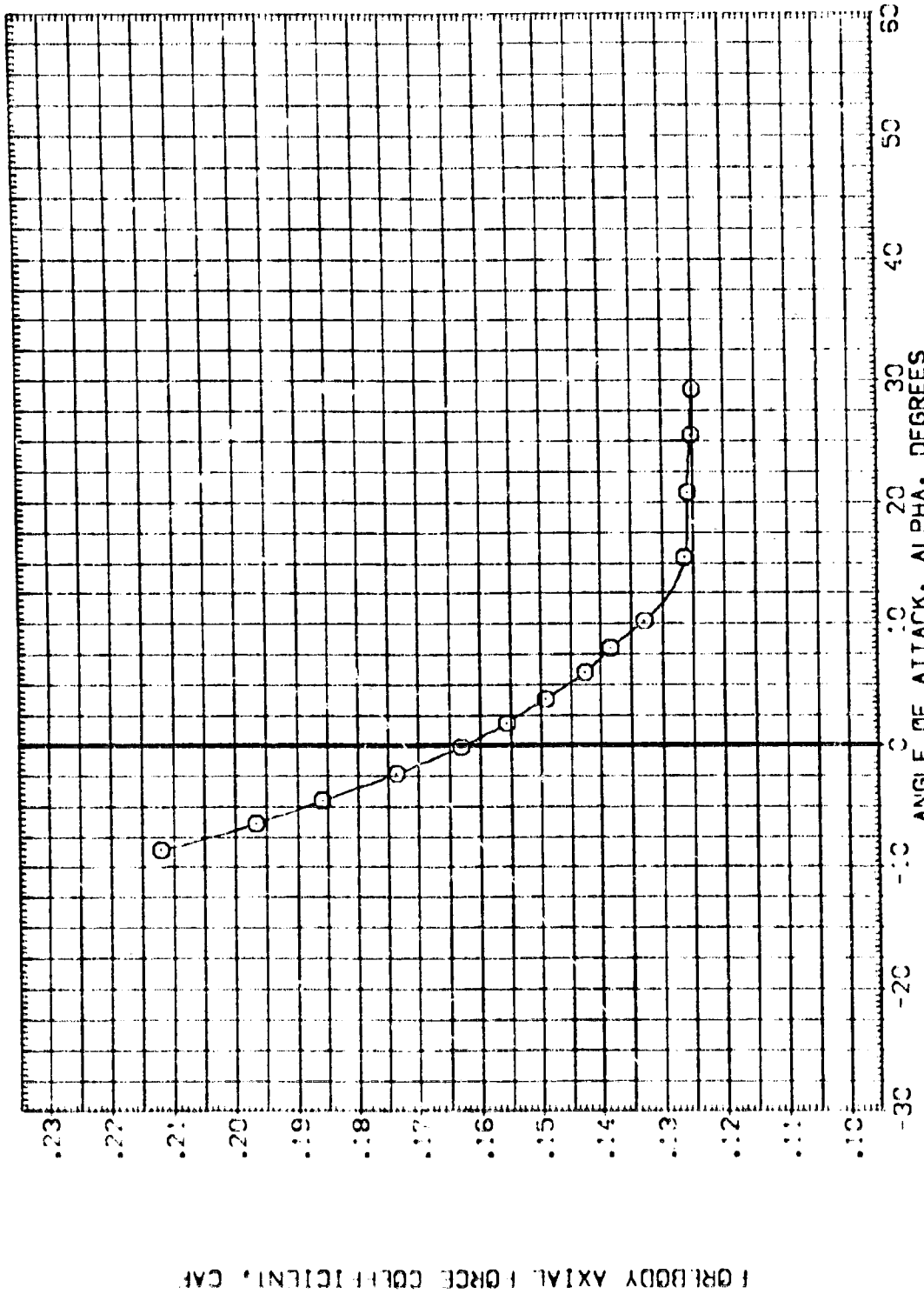


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

REFERENCE INFORMATION
 DATE: 10/10/60
 BY: [illegible]
 FOR: [illegible]
 SCALE: 1:1

BETA: 0.000
 PUDDER: 0.000
 R.E. 10: 0.000

CONFIGURATION DESCRIPTION
 1.18 - ABC 3.5 1.8 0.28 1.18 1.18
 1.18 - ABC 3.5 1.8 0.28 1.18 1.18

DATA: 5.1 5.1
 (A. SEC) 1
 (A. SEC) 1

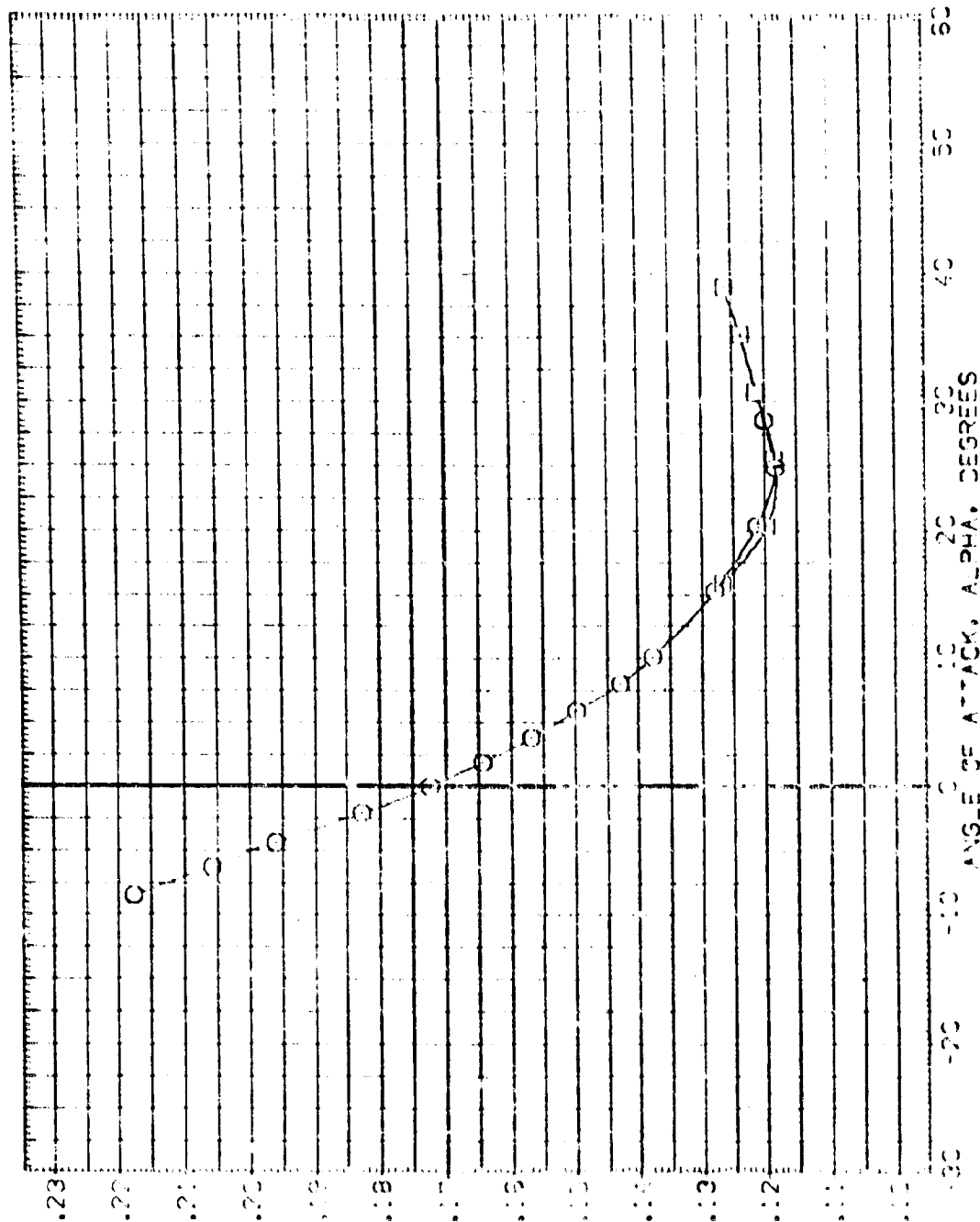


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

DATA SET SYMBOL	CONFIGURATION DESCRIPTION
1	1A18 - ARC 3.5 101 - CABINET + TANK
2	DATA NOT AVAILABLE

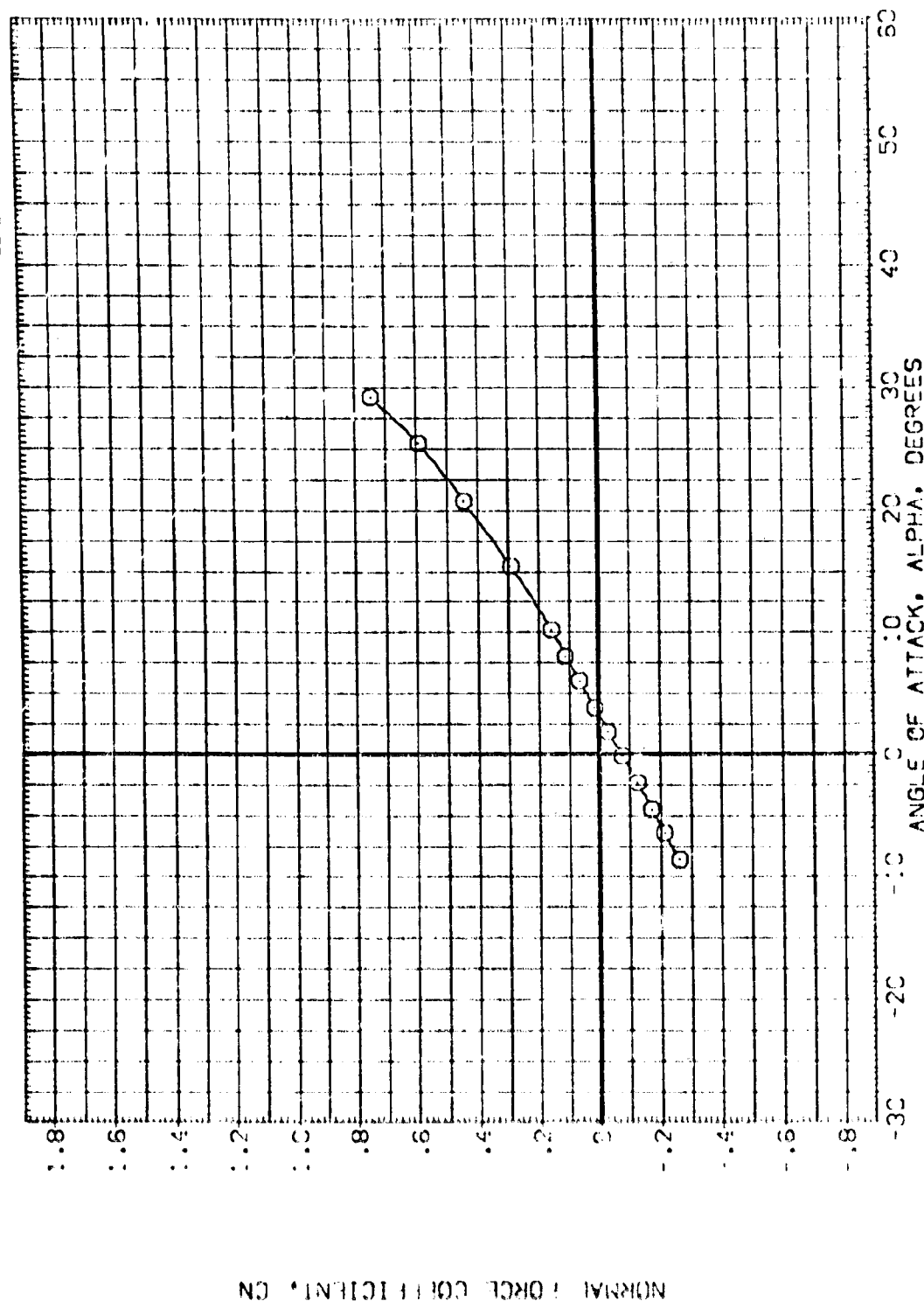


FIG. 4. EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

3.29

11
12
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14

4

DATA SET SYMBOL
 (X) SCALING
 (P) SCALING

CONFIGURATION DESCRIPTION
 TAIL - ARC 3.5 191 - CRIBITER + TANK
 TAIL - ARC 3.5 191 - CRIBITER + TANK

BETA RUDDER ELEVON
 .000 .000 .000 .000

REFERENCE INFORMATION
 SREF 2680.0000 SQ.FT.
 LREF 160.3000
 BREF 160.3000
 XMRP 979.0000
 YMRP 1000.0000
 ZMRP 400.0000
 SCALE 0.00

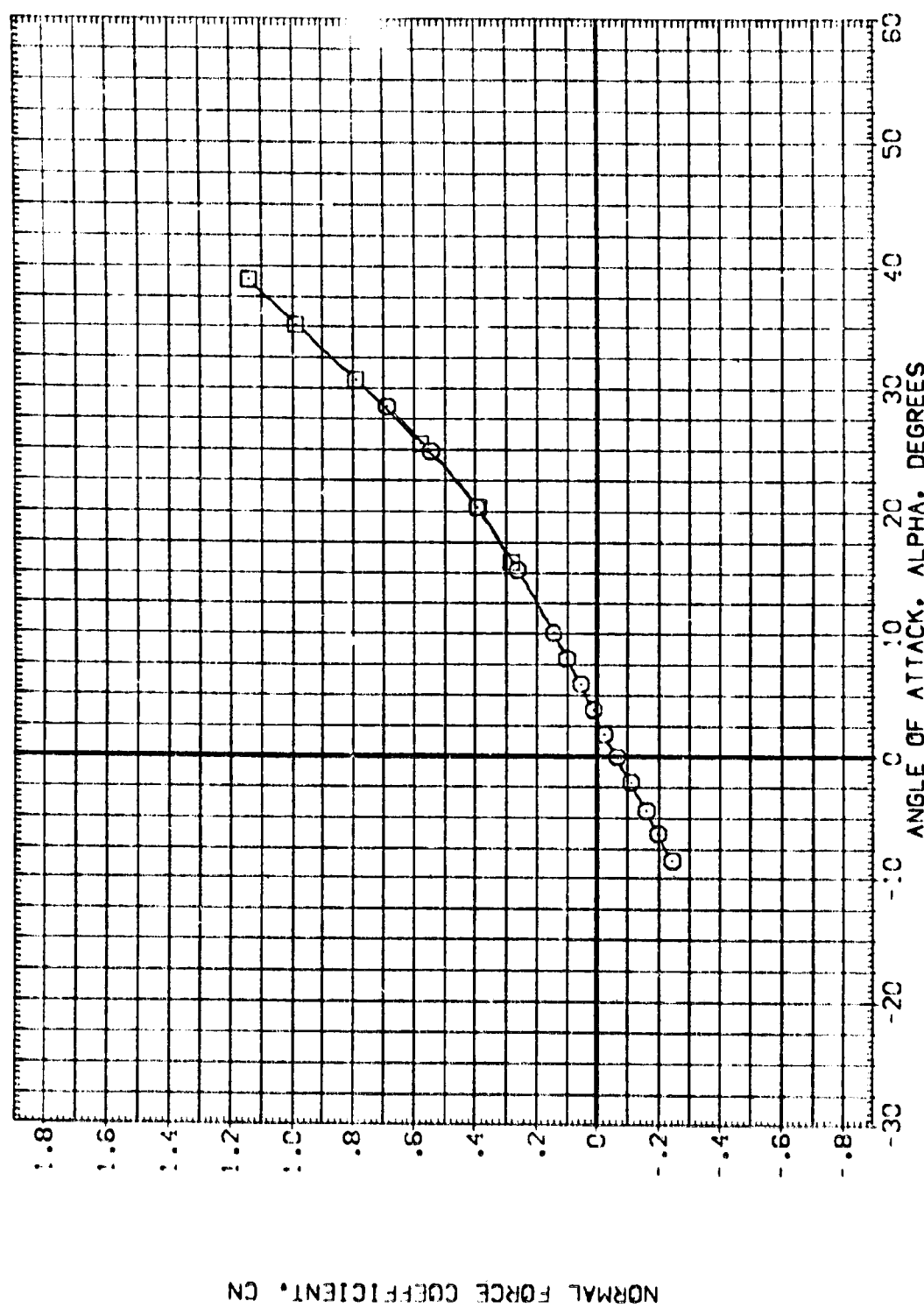


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

(B)MACH = 7.32

DATA SET SYMBOL: 1018 - ARC 3.5 19: - OPSITER + TANK
 (RESCU) DATA NOT AVAILABLE
 (RESUOS)

BETA: .000
 RUDDER: .000
 ELEVON: .000

REFERENCE INFORMATION
 SREF: 2690.0000 SQ. FT.
 LREF: 1280.3000 IN.
 BREF: 1280.3000 IN.
 WREF: 978.0000 IN.
 WREF: 400.0000 IN.
 SCALE: 10.00

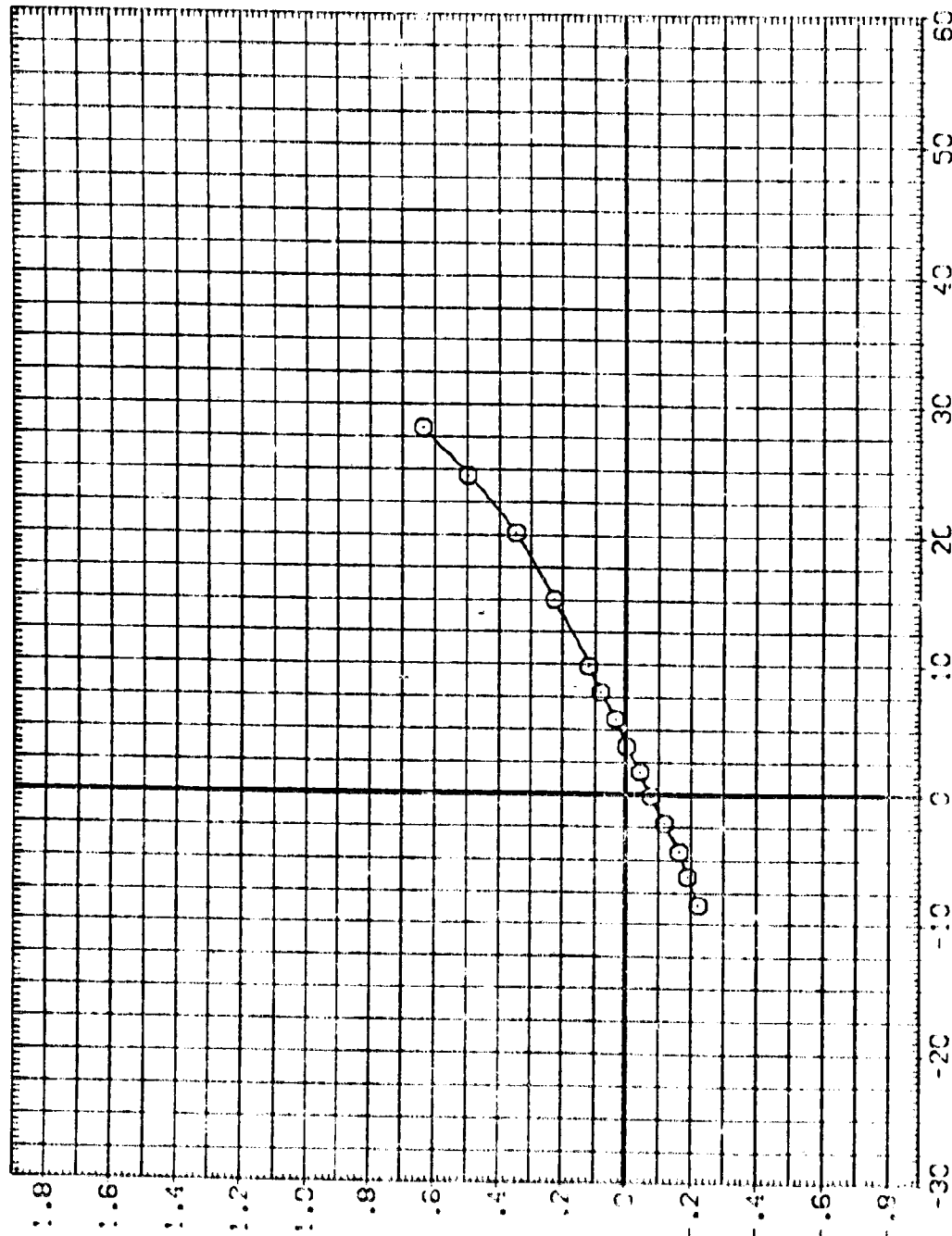


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

MAC = 10.29

REFERENCE INFORMATION
 SREF 2690.0000 SQ.F.
 BREF 1290.3000
 BREF 1290.3000
 BREF 579.0000
 XREF 400.0000
 YREF 400.0000
 ZREF 400.0000
 SCALE 0.000

BETA RUDDER ELEVON
 .000 .000 .000
 .000 .000 .000

DATA SYMBOL CONFIGURATION DESCRIPTION
 * SC001 1118 - ARC 3.5 191 - ORBITER + TANK
 * SC002 DATA NOT AVAILABLE

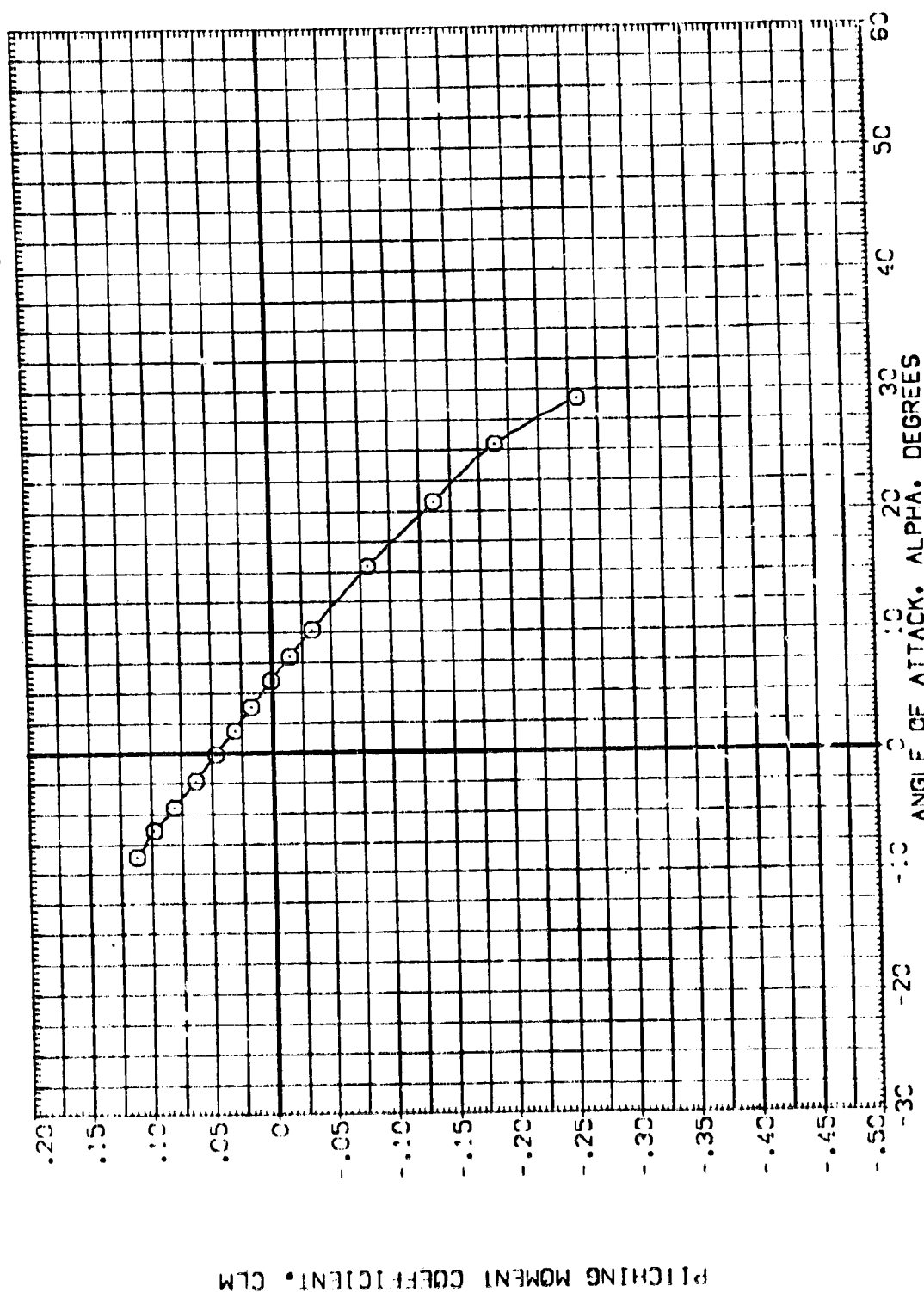


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

DATA BY SYMBO. CONFIGURATION DESCRIPTION REFERENCE INFORMATION

SYMBOL	CONFIGURATION DESCRIPTION	BETA	RUDDER	ELEVON	SREF	WING AREA	WING SPAN	WING CHORD	WING TAPER	WING INCIDENCE	WING TWIST	WING DITCH	WING TAPER	WING TWIST	WING DITCH
1A18	ARC 3.5 (8) - CRATER - TAN	.000	.000	.000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000
1A18	ARC 3.5 (8) - CRATER - TAN	.000	.000	.000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000	1680.0000

SCALE 400.0000

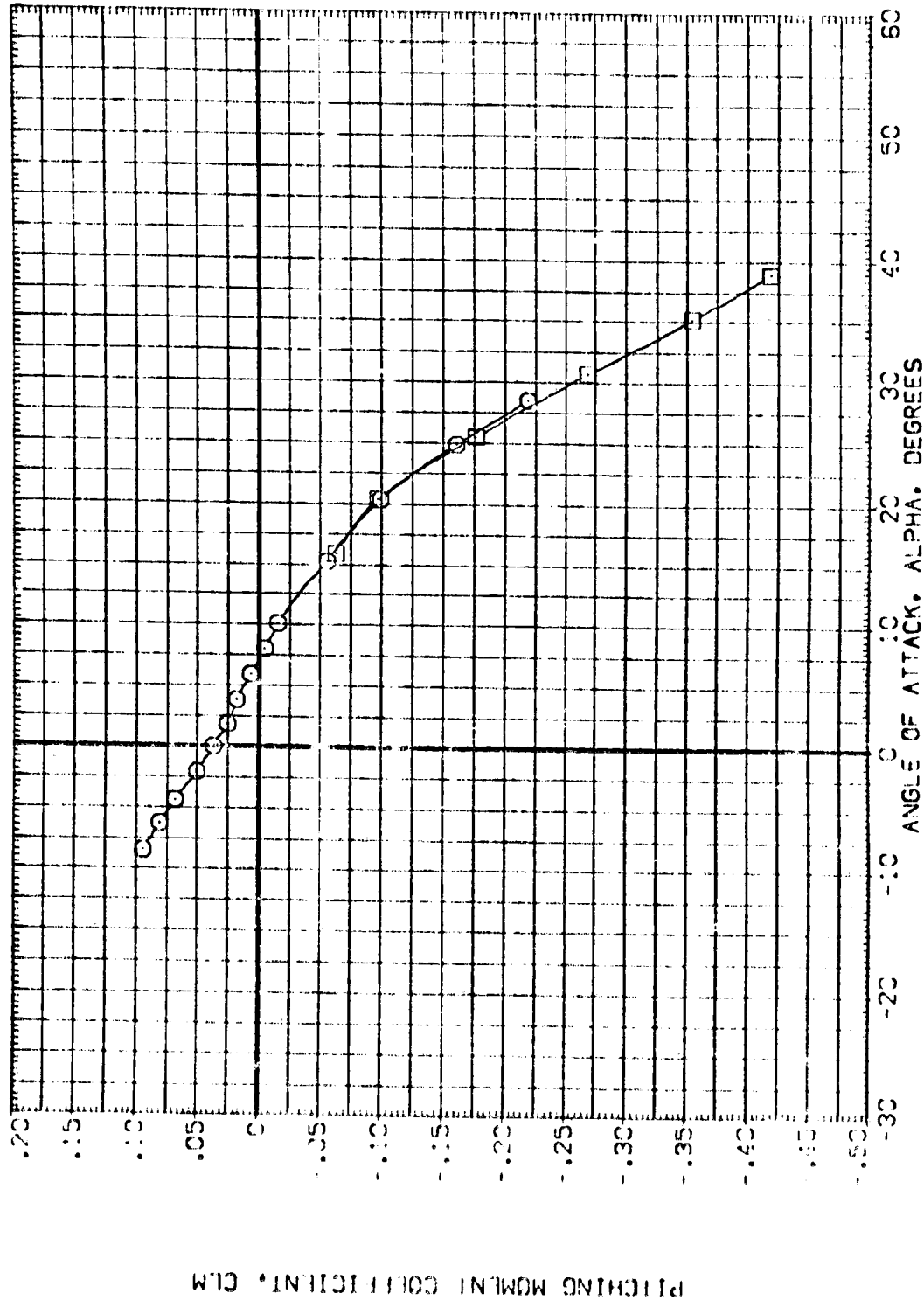


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

CONFIDENTIAL - 7.32

DATA SET SYMBOL: C
 (R: SC01)
 (P: SC05)

CONFIGURATION DESCRIPTION
 JAB - ARC 3.5 191 - ORBITER + TANK
 DATA NOT AVAILABLE

BETA .000
 RUDDER .000
 ELEVON .000

REFERENCE INFORMATION
 SREF 2680.0000 SQ. FT.
 LREF 1200.0000 IN.
 BREF 1200.0000 IN.
 XREF 9.9 IN.
 YREF 0.0000 IN.
 ZREF 0.0000 IN.
 SCALE 400 0.000

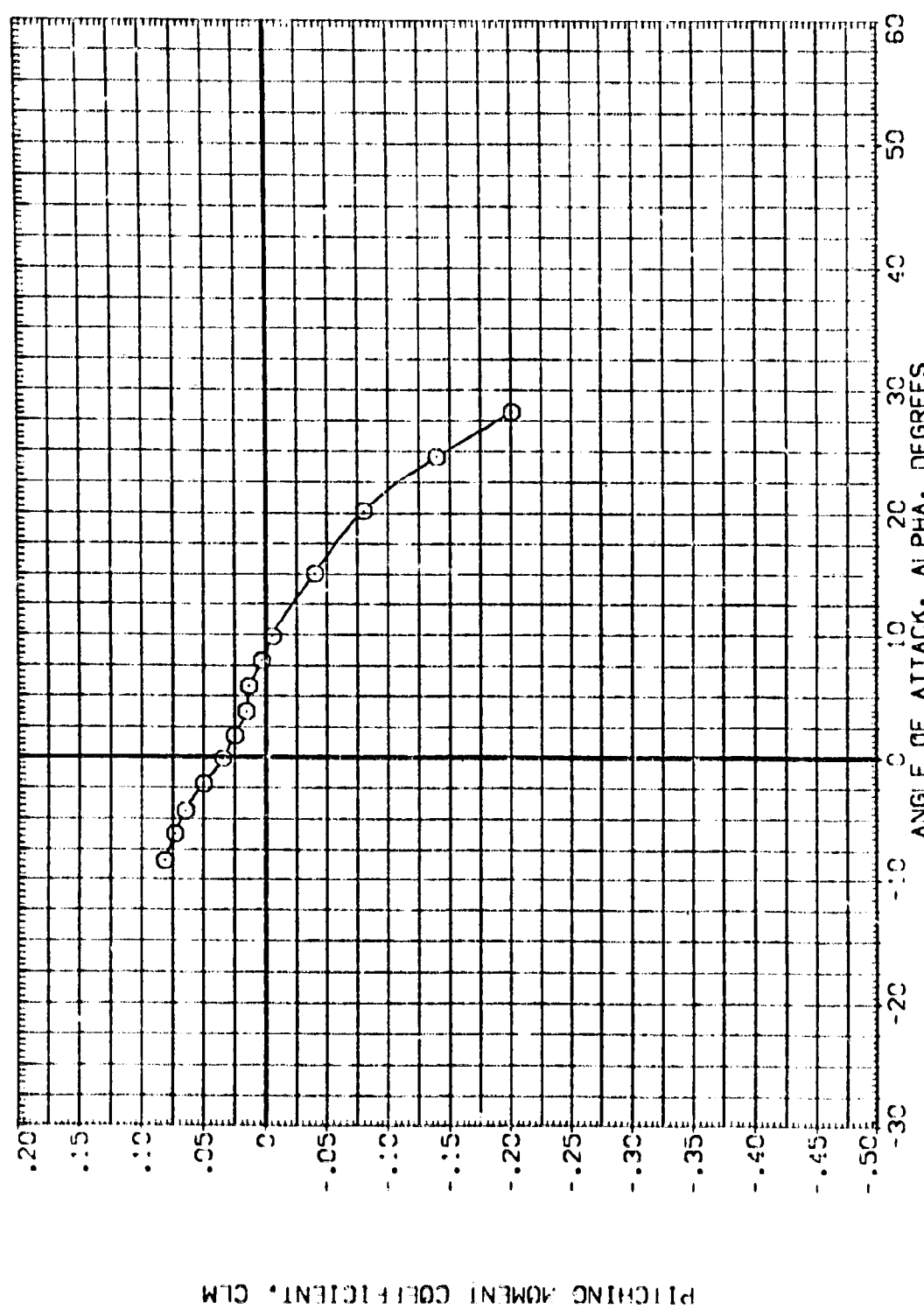


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

(C)MACH = 10.29

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FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

DATA SET SYMB.	CONFIGURATION DESCRIPTION
1A18	ARC 3.5.10: - CR3PITER + TANK
1A19	DATA CVT AVAILABLE

BETA	RUDER	ELEVEN
.000	.000	.000
.000	.000	.000

REFERENCE INFORMATION	
SP4	2000 0000
SP5	2000 0000
SP6	2000 0000
SP7	2000 0000
SP8	2000 0000
SP9	2000 0000
SP10	2000 0000
SP11	2000 0000
SP12	2000 0000
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SP14	2000 0000
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SP97	2000 0000
SP98	2000 0000
SP99	2000 0000
SP100	2000 0000

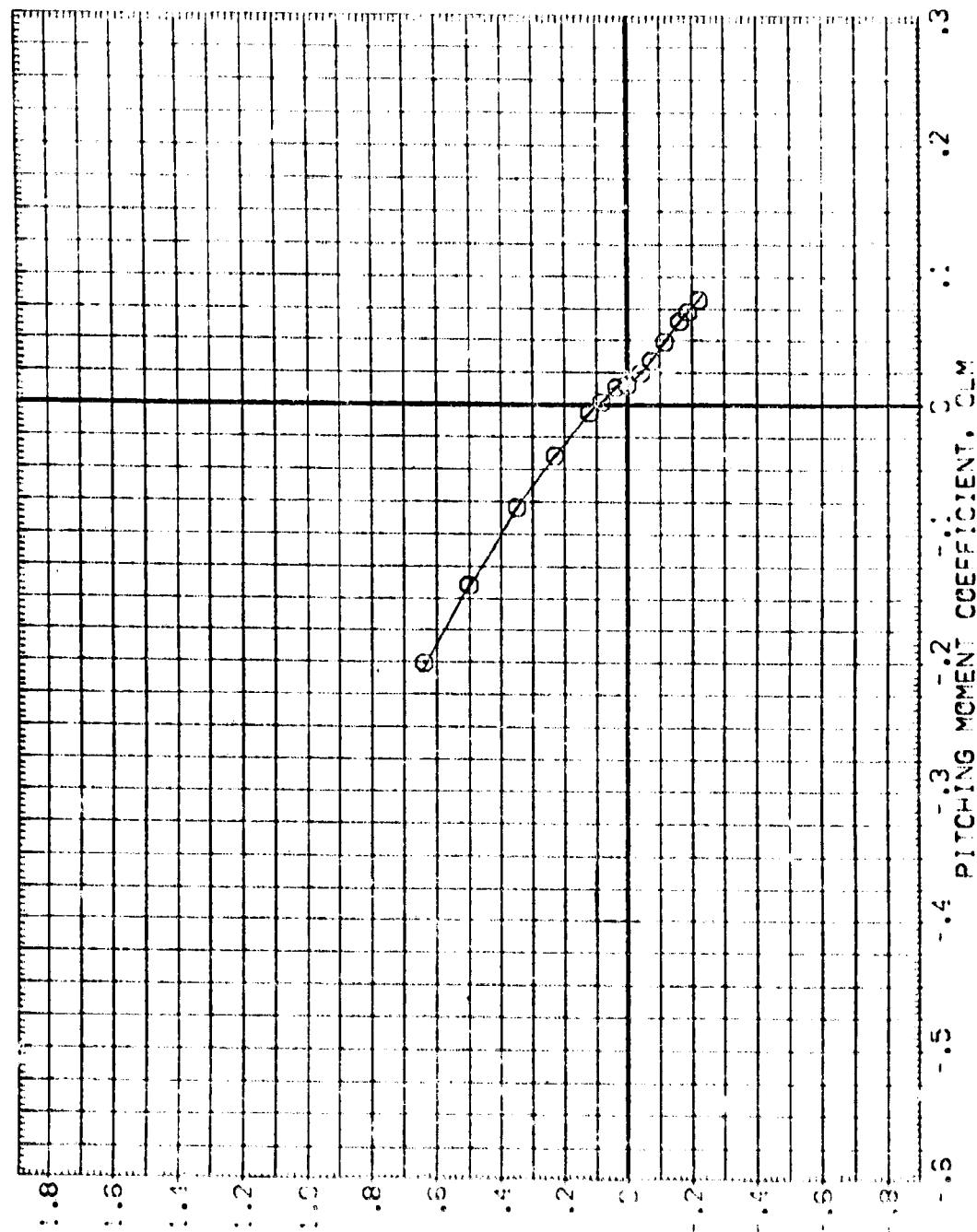


Fig. 4 Effect of Mach number on second stage longitudinal aerodynamic characteristics

IA18 - ARC 3.5 19: YANK

(RES006)

SYMBOL:
 5.789
 7.370
 12.789

PARAMETRIC VALUES
 BETA: .000
 RUDER: .000
 ELEVON: .000

MACH:
 5.789
 7.370
 12.789

REFERENCE INFORMATION
 SR.F: 2680.0000
 D.F: 1787.3000
 BR: 1787.3000
 VMO: 979.0000
 VMCO: 400.0000
 SCALE: 1.0000

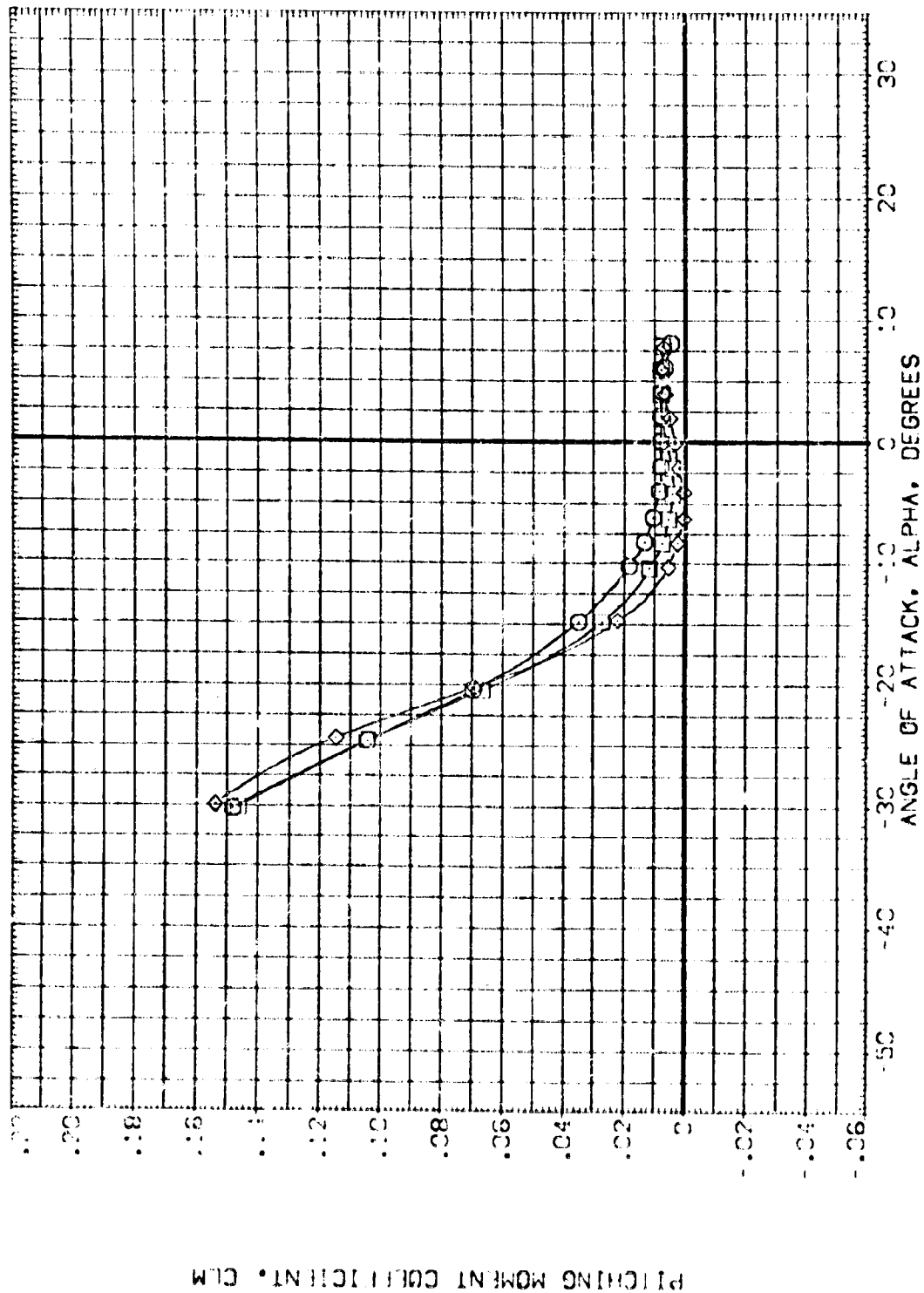


FIG. 5 EFFECT OF MACH NUMBER ON ISOLATED ET LONGITUDINAL AERODYNAMIC CHAR.

SRCF	2890-3000
RFF	760-1000
BRE	1200-3000
VWVZ	-1000
+C-	1000
SCALE	+

REFERENCE IN CAPTION.

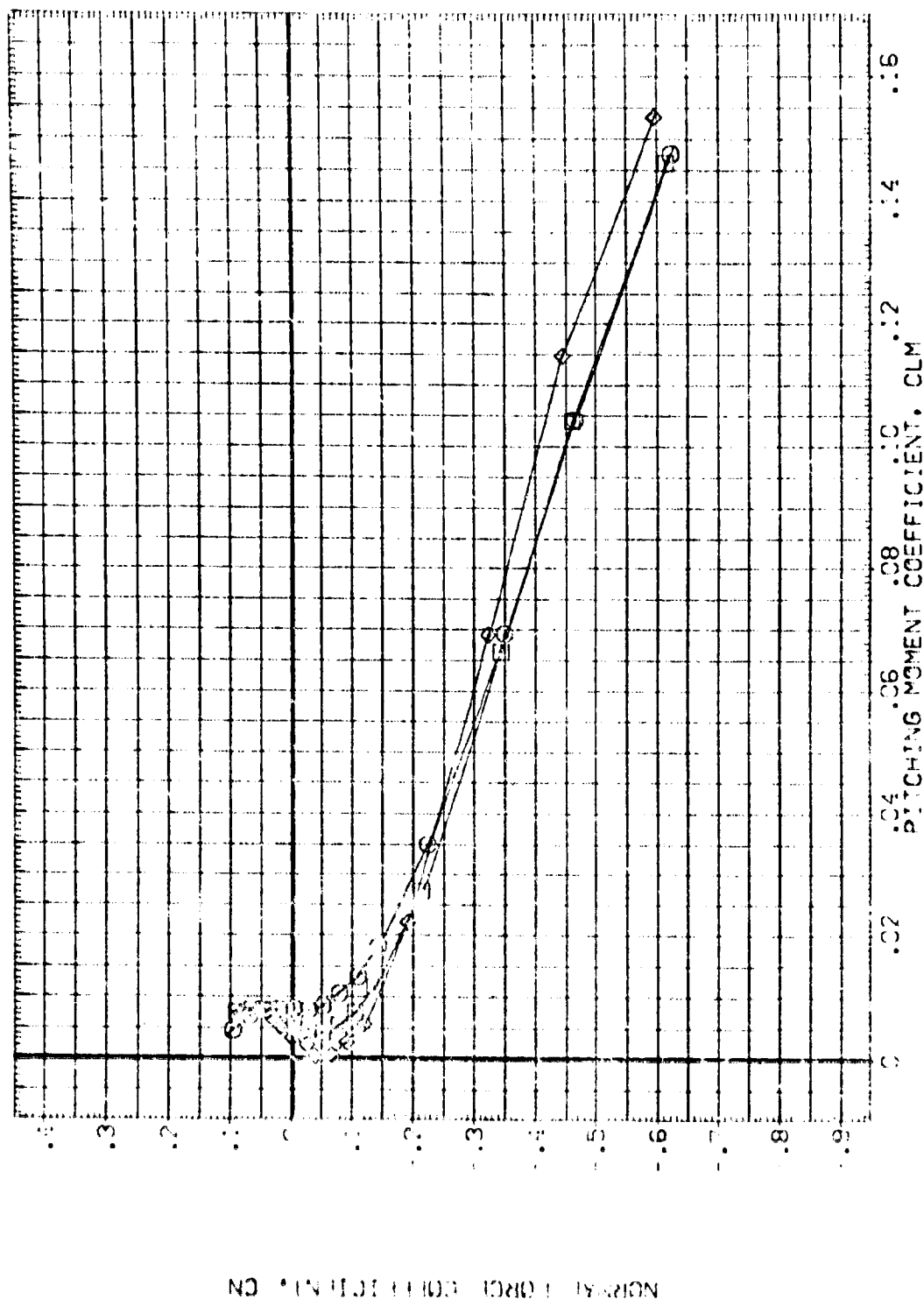


FIG. 5 EFFECT OF MACH NUMBER ON ISOLATED ET LONGITUDINAL AERODYNAMIC CHAR.

DATA SET SYMBOL
 * S002
 * S003
 * S004

CONFIGURATION DESCRIPTION
 A18 - ARC 3.5 (9) - C93:TER + TANK
 A18 - ARC 3.5 (9) - C93:TER + TANK
 A18 - ARC 3.5 (9) - C93:TER + TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2690.0000 SO.FT.
 REF 1200.0000
 BREF 1200.0000
 XREF 579.0000
 YREF 400.0000
 ZREF 400.0000
 SCALE 400.0000

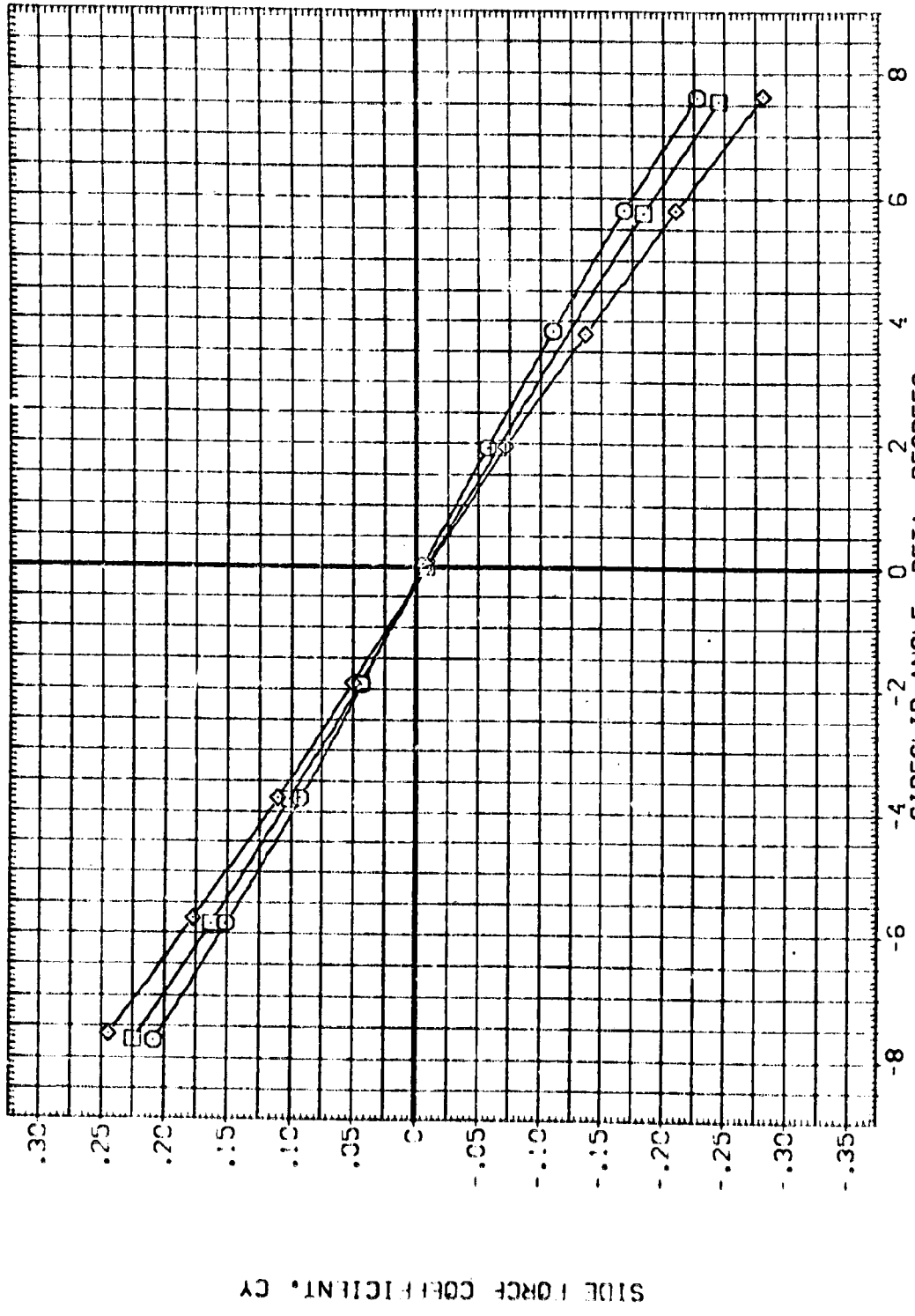


FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

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PAGE : 8

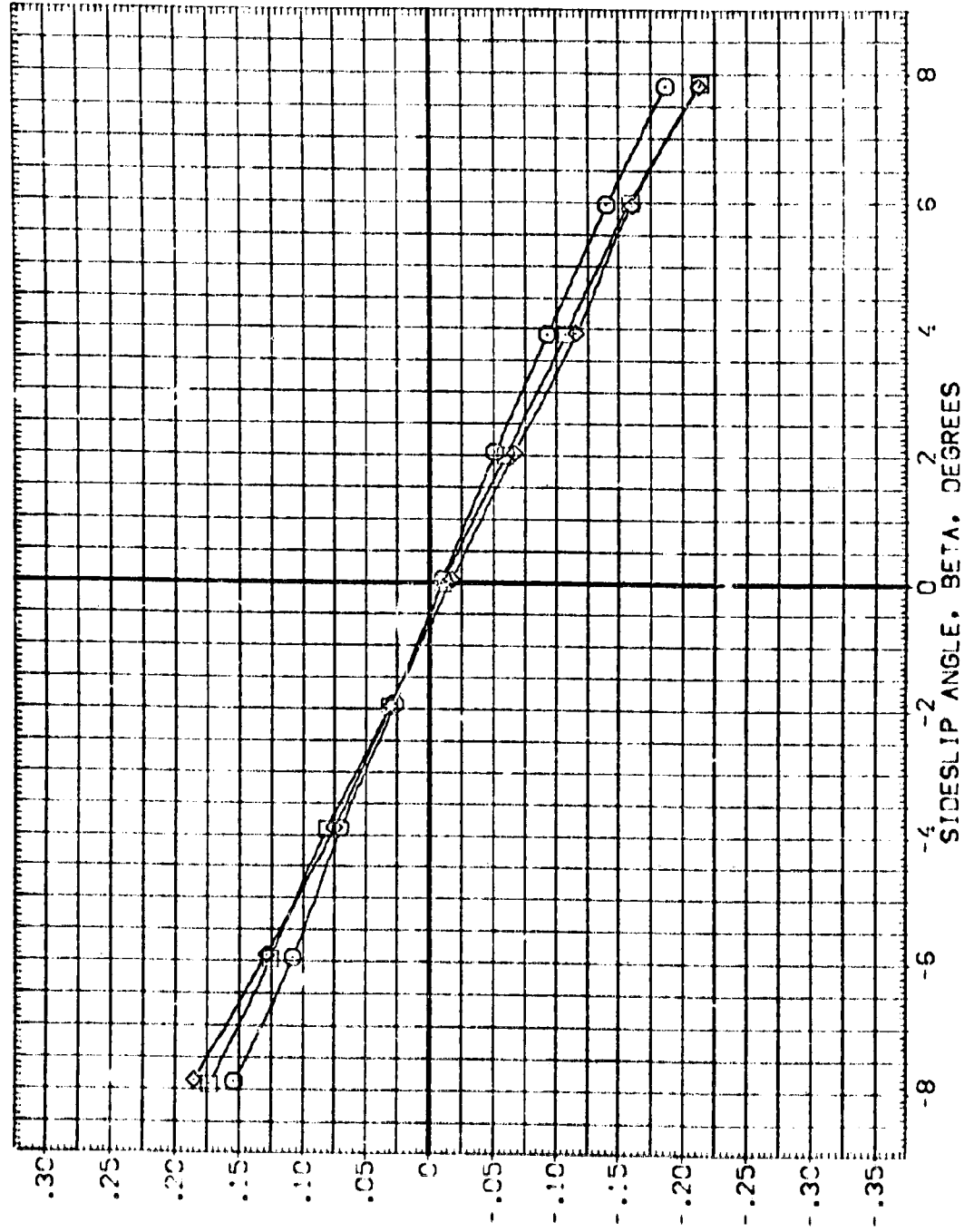
(b) (7)(C),
(b) (7)(D),
(b) (7)(F),
(b) (7)(G),
(b) (7)(H),
(b) (7)(I)

DATA SET SYMBOL
 1
 2
 3
 4

CONFIGURATION DESCRIPTION
 1: 8 - ABC 3.5 19: - CRGITER + TANK
 2: 8 - ABC 3.5 19: - CRGITER + TANK
 3: 8 - ABC 3.5 19: - CRGITER + TANK
 4: 8 - ABC 3.5 19: - CRGITER + TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2890.0000 SQ.FT.
 LREF 1.280.0000 IN.
 BREF 1.280.0000 IN.
 XREF 979.0000 IN.
 YREF 400.0000 IN.
 ZREF 400.0000 IN.
 SCALE .0100



SIDE FORCE COEFFICIENT, CY

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERC. CHAR.
 COMAC = 0.29
 PAGE 9

DATA SET SYMBOL: 1
 CONFIGURATION DESCRIPTION: 1
 1A18 : ARC 3.5 (9) : 0231TER : TANK
 1A18 : ARC 3.5 (9) : 0231TER : TANK
 1A18 : ARC 3.5 (9) : 0231TER : TANK
 REFERENCE INFORMATION: 1
 SREF: 2680.0000 SQ.FT.
 REF: 1.0000
 BREF: 1.0000
 XREF: 5.0000
 YREF: 400.0000
 ZREF: 1.0000
 SCALE: 0.000

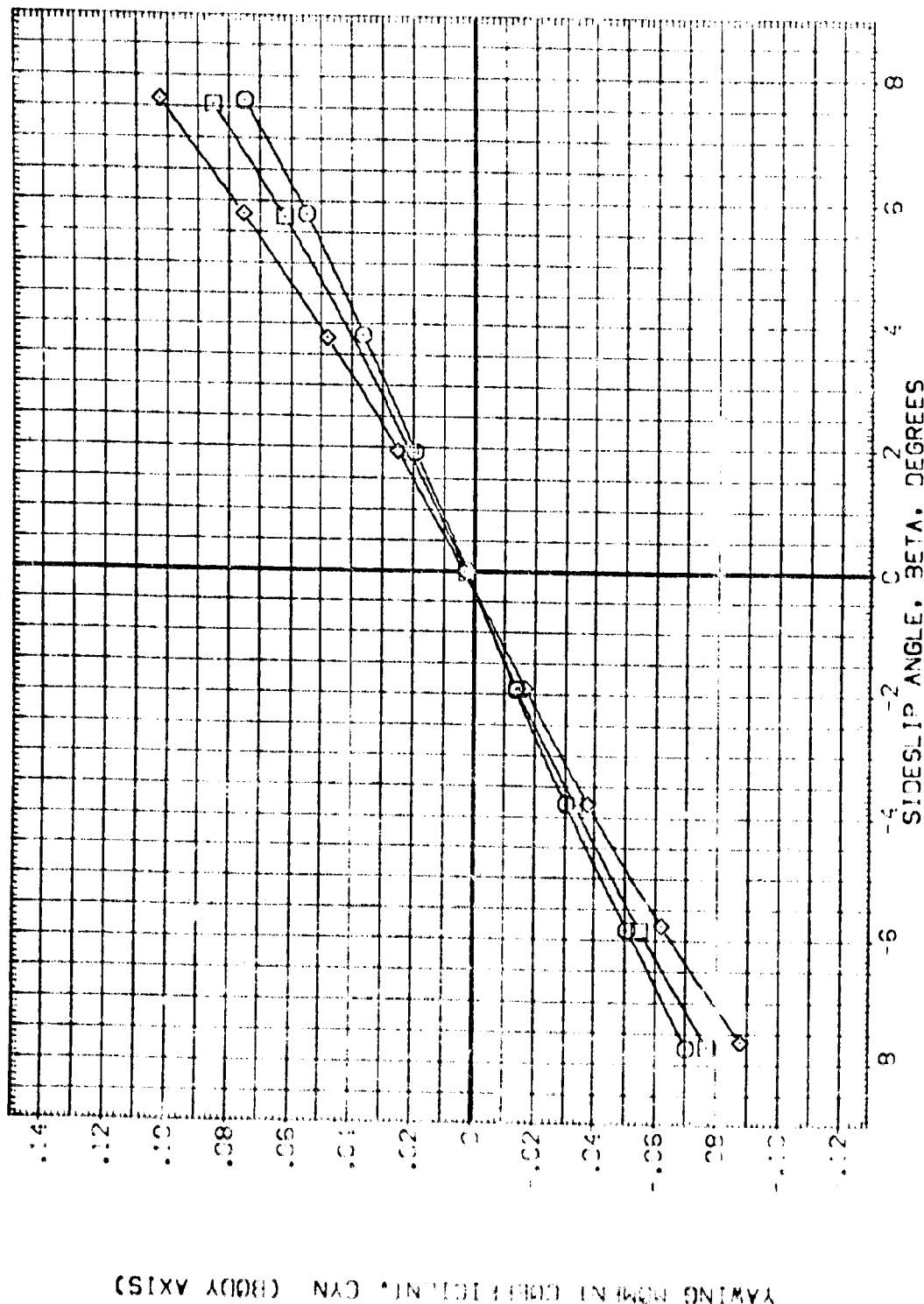


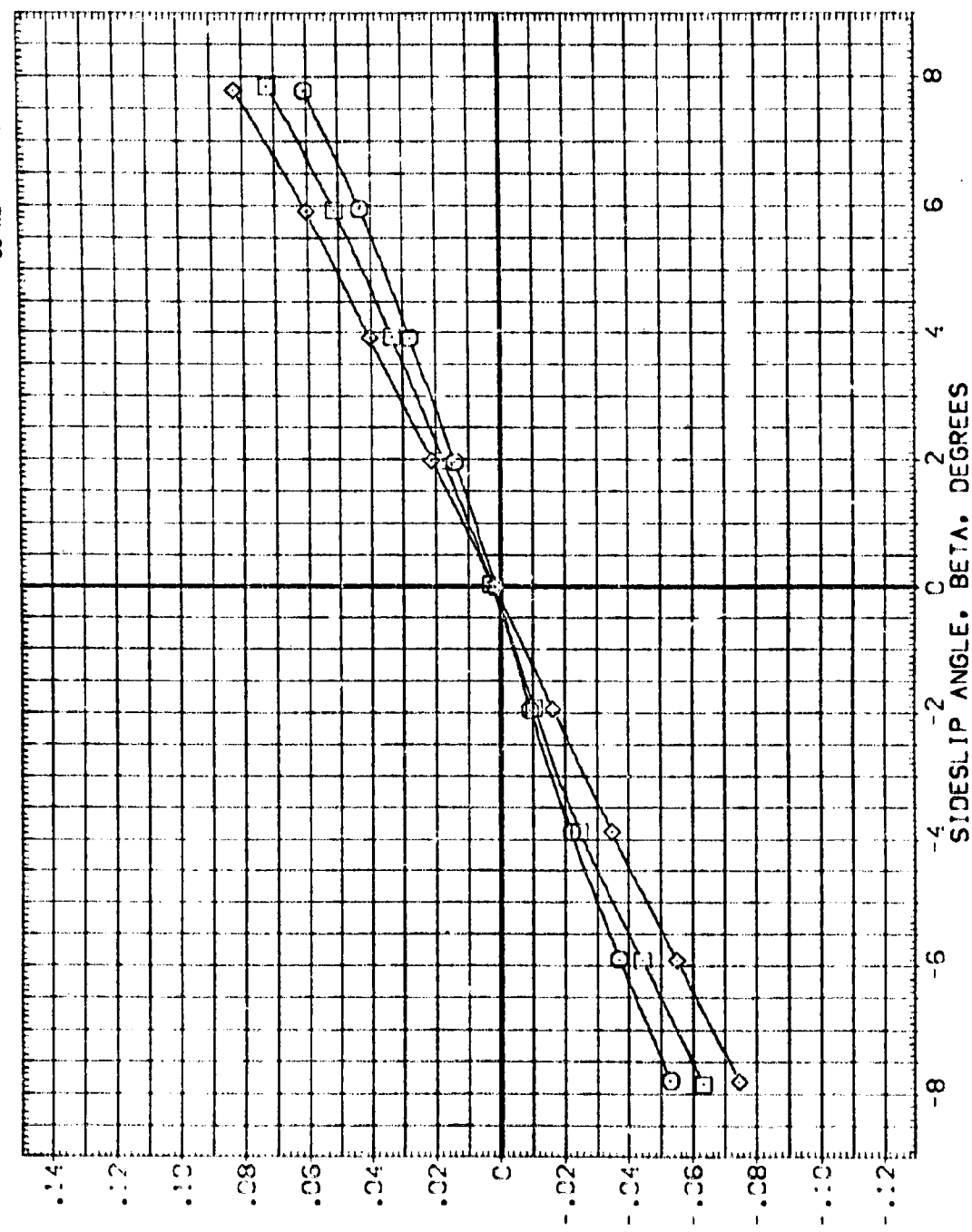
FIG. 8 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

REFERENCE INFORMATION
 SREF 2890.0000 50. FT.
 R1 1.000000
 BR1 1.000000
 X1 1.000000
 Y1 1.000000
 Z1 1.000000
 SCALE 400.000000

ALPHA RUDDER ELEVON
 4.0000
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 .0000
 -4.0000

CONFIGURATION DESCRIPTION
 1A18 - APC 3.5 191 - CR31TER + TANK
 1A18 - APC 3.5 191 - CR31TER + TANK
 1A18 - APC 3.5 191 - CR31TER + TANK

DATA SYMBOL
 (X) SC02
 (X) SC03
 (X) SC04
 (X) SC05



YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

DATA SET SYMBOL
 1 5000
 2 5000
 3 5000

CONFIGURATION DESCRIPTION
 1A18 - ARC 3.5 191 - ORBITER + TANK
 1A18 - ARC 3.5 191 - ORBITER + TANK
 1A18 - ARC 3.5 191 - ORBITER + TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2690.0000 50.01
 XREF 1250.0000 11.00
 YREF 1250.0000 11.00
 XMAP 979.0000 11.00
 YMAP 400.0000 11.00
 SCALE 1.00

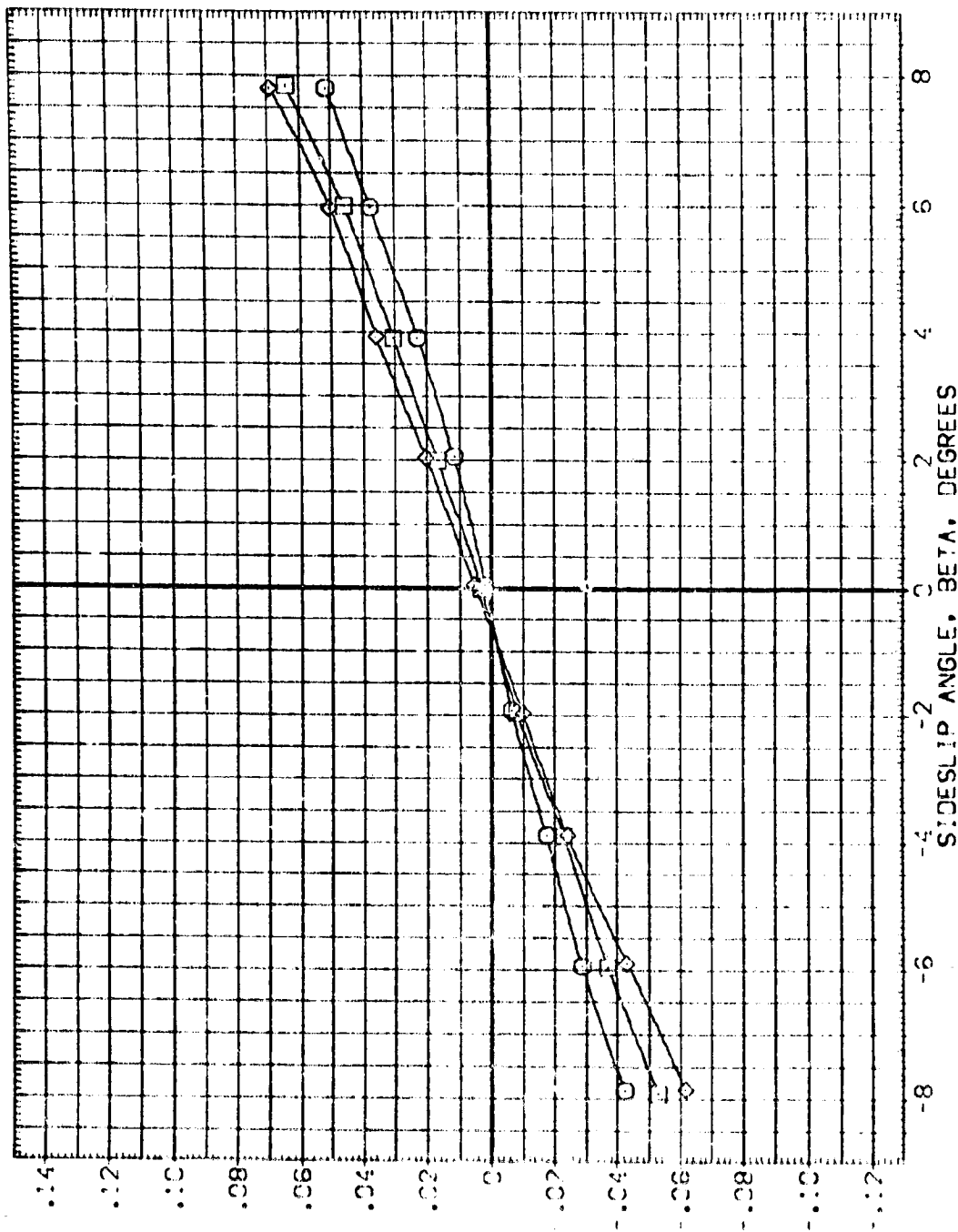


FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

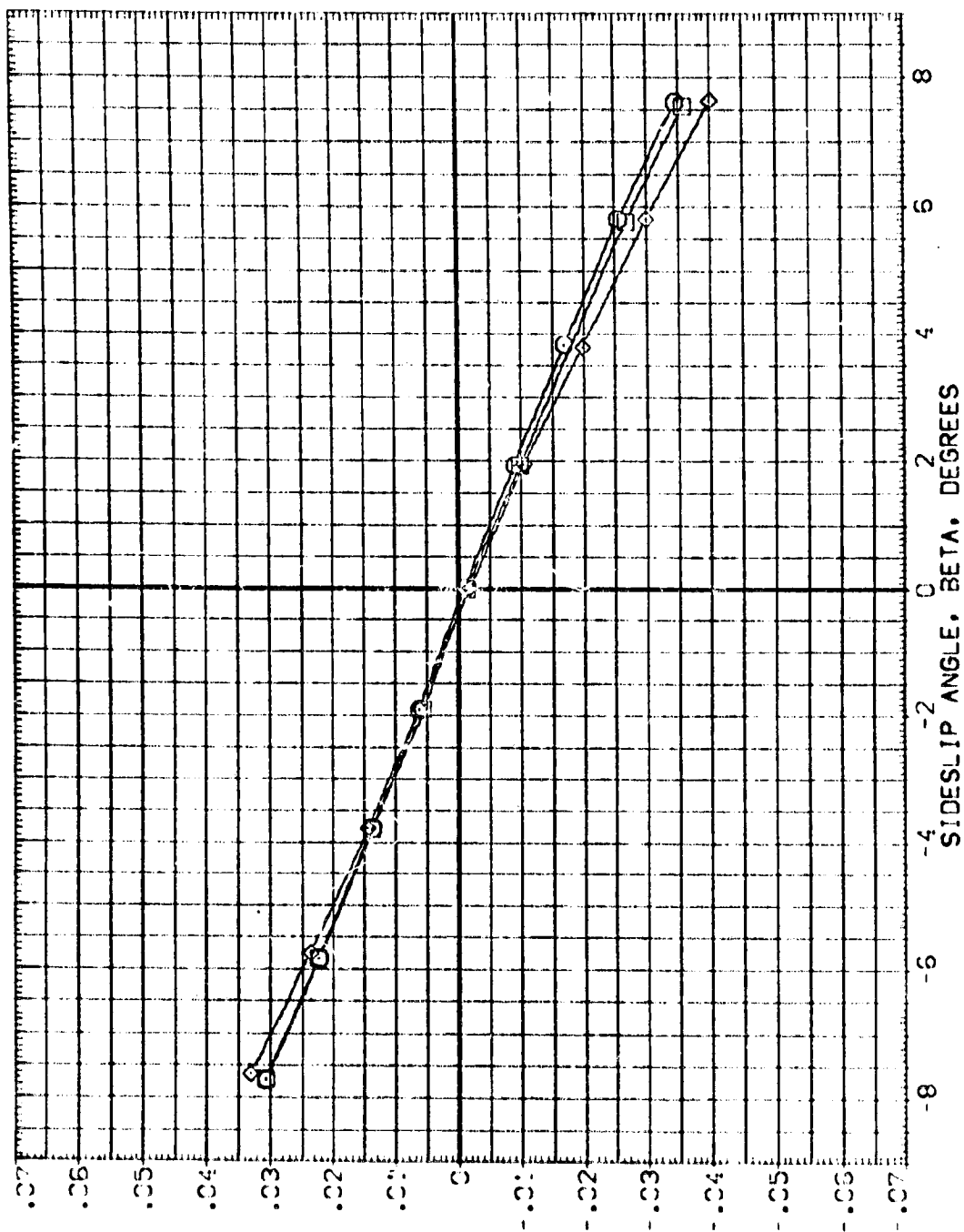
COMAC = 10.29

DATA SET SYMBOL: ()
 (X) SC003
 (X) SC003
 (X) SC003

CONFIGURATION DESCRIPTION:
 A18 - ARC 3.5 (9) - CRIBITER + TANK
 A18 - ARC 3.5 (9) - CRIBITER + TANK
 A18 - ARC 3.5 (9) - CRIBITER + TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION:
 SREF 2690.0000 SQ. FT.
 LREF 1200.0000
 SREF 1200.0000
 VREF 239.0000
 VREF 6.0000
 VREF 400.0000
 VREF 400.0000
 SCALE



ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

1119

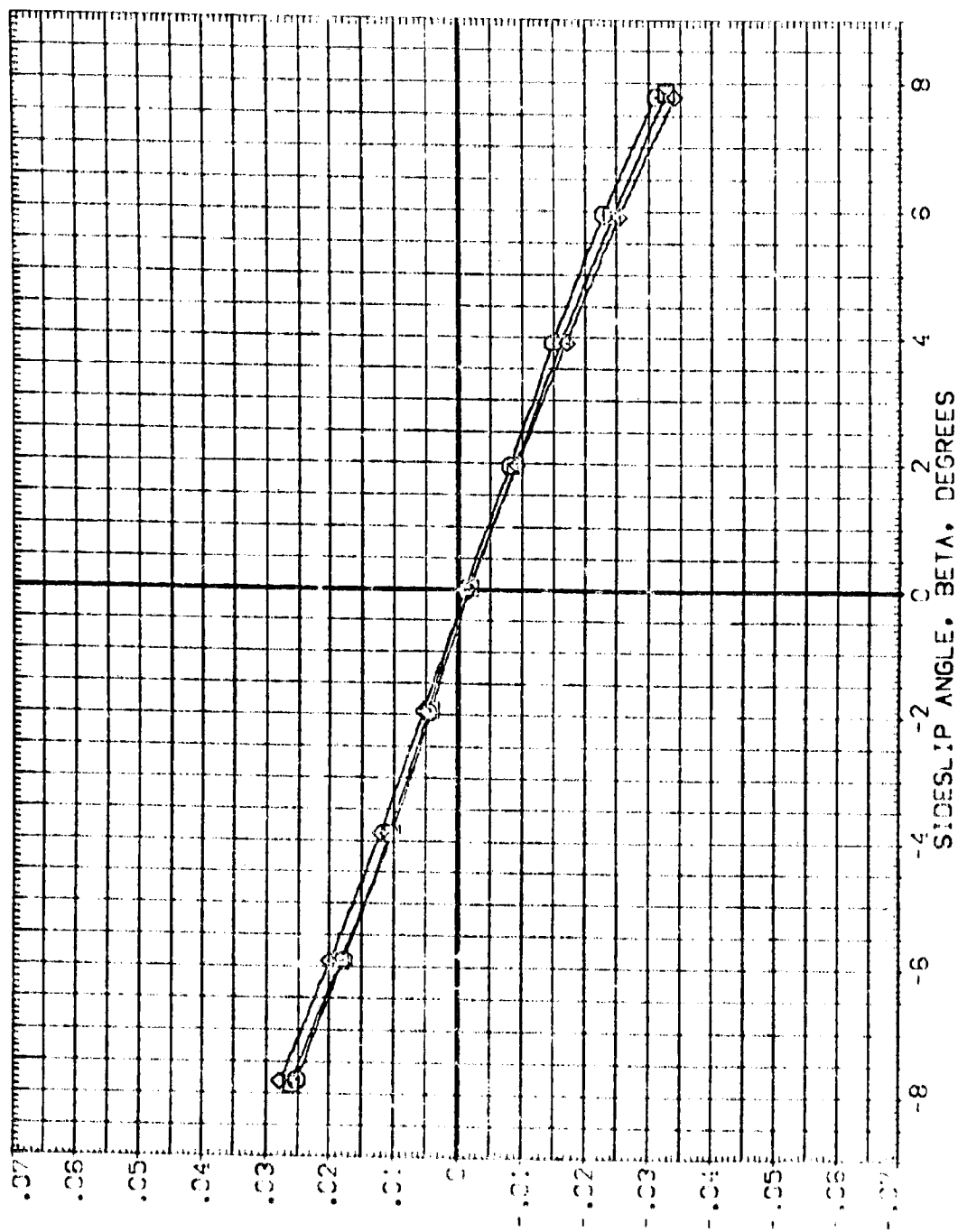
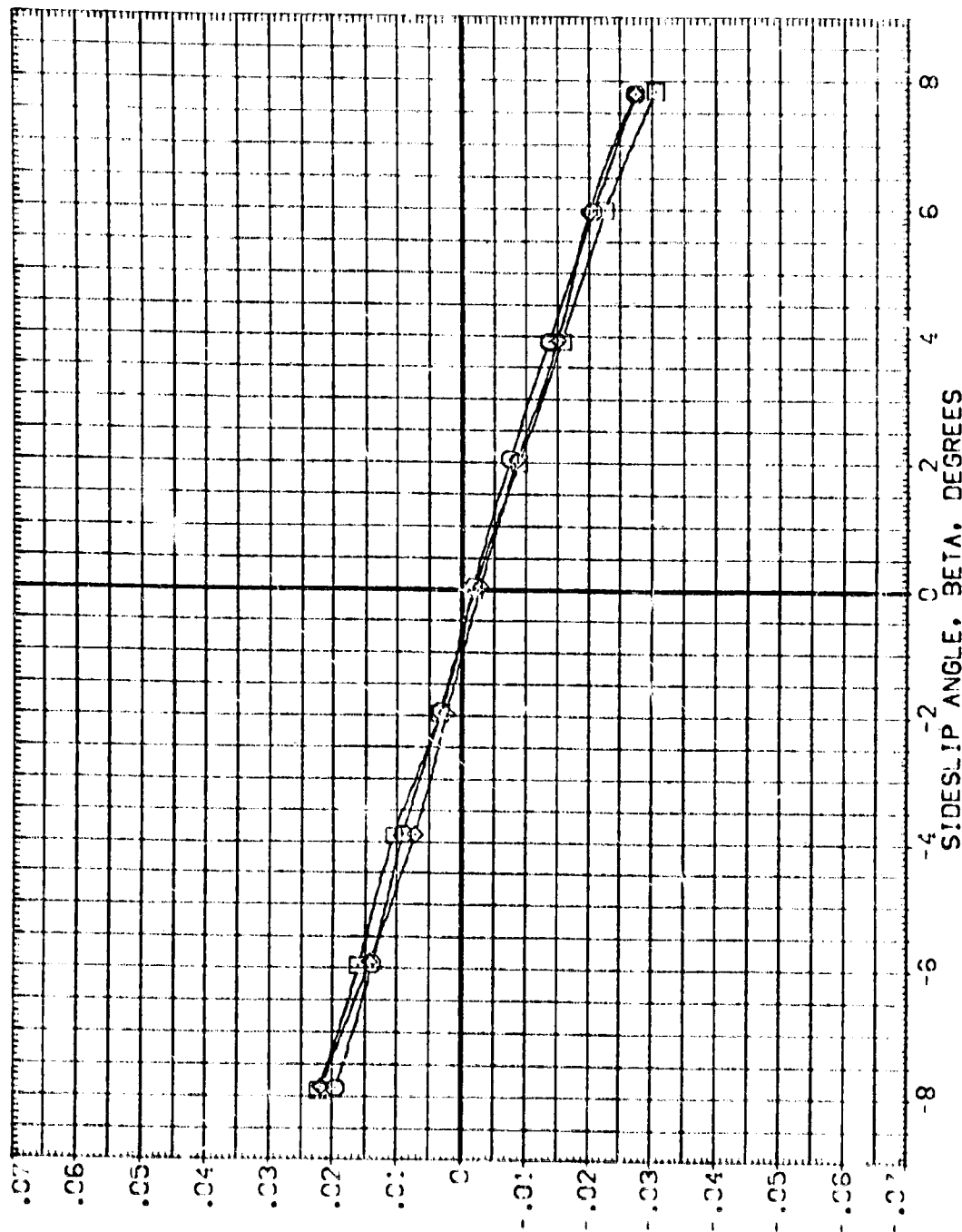
[illegible]

FIG. 9 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

DATA SET SYMBOL: 18 - APC 3.5 (9) - CR3TER + TANK
 19 - APC 3.5 (9) - CR3TER + TANK
 20 - APC 3.5 (9) - CR3TER + TANK

REFERENCE INFORMATION:
 SREF: 2890.0000 50.00
 LREF: 1000.0000 1.00
 XREF: 1000.0000 1.00
 YREF: 1000.0000 1.00
 XREF: 1000.0000 1.00
 YREF: 1000.0000 1.00
 SCALE: 400 10000

ALPHA: 4.000
 RUDER: 0.000
 ELEVON: 0.000



ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

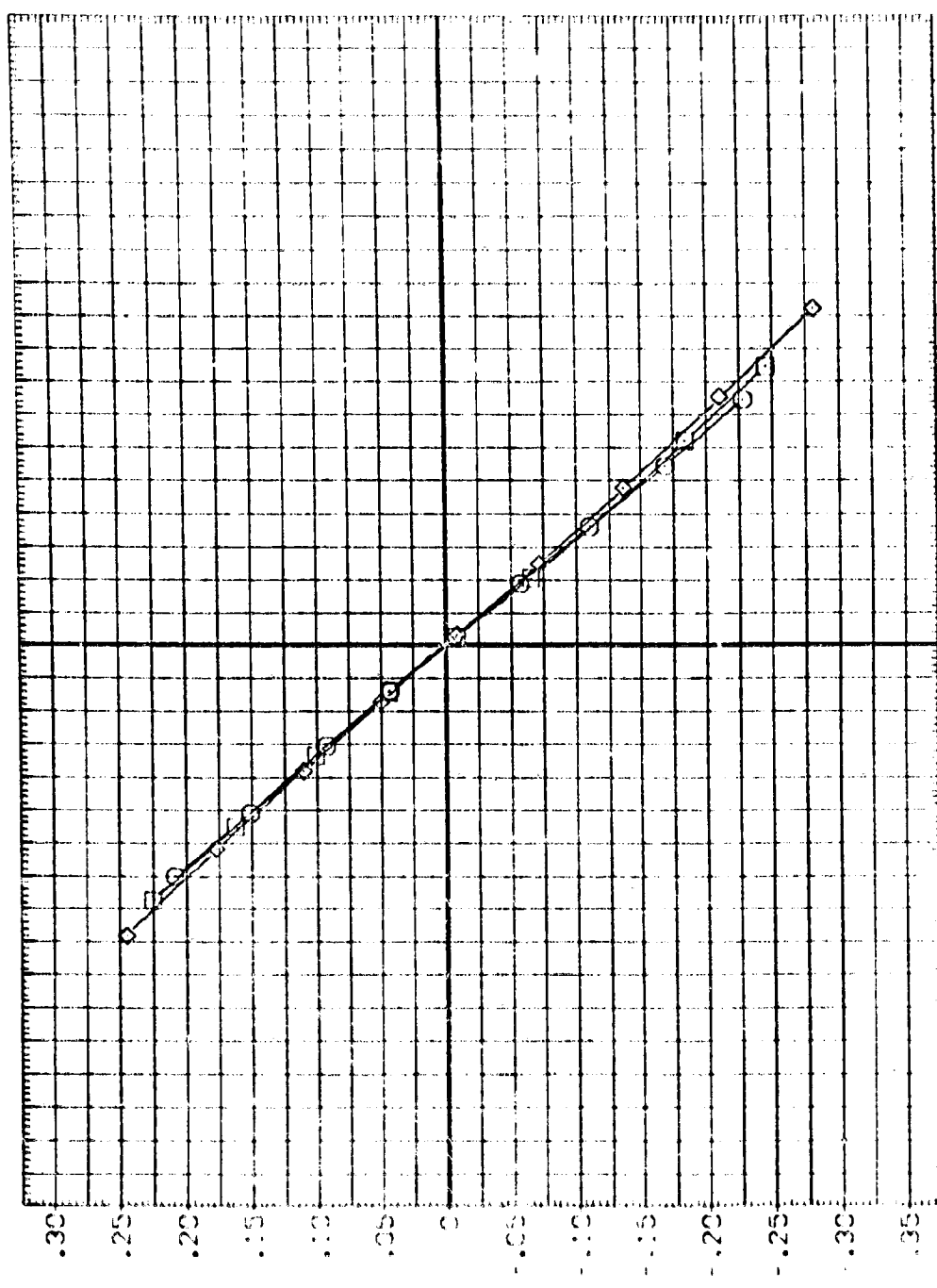
FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

REFERENCE INFORMATION
 SKEW 0.000000
 REF 0.000000
 ST 0.000000
 X 0.000000
 Y 0.000000
 Z 0.000000
 SCALE 10.000

ALPHA 4.000
 RUDDER 0.000
 ELEVON 0.000

CONFIGURATION DESCRIPTION
 1A18 - ARC 3.5 (9) - ORBITER + TANK
 1A18 - ARC 3.5 (9) - ORBITER + TANK
 1A18 - ARC 3.5 (9) - ORBITER + TANK

DATA SET SYMBOL
 RE SC02
 2 SC03
 3 SC04



0.15 0.12 0.08 0.04 0 0.04 0.08 0.12 0.15
 VANGING MOMENT COEFFICIENT, CVN (BODY AXIS)

FIG. 8 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

REFERENCE INFORMATION
 SREF 2600.0000 SQ.FT.
 LREF 100.0000
 BREF 100.0000
 XWOP 578.0000
 YWOP 0000
 ZWOP 400.0000
 SCALE

ALPHA RUDDER ELEVON
 4.000 .000
 -4.000 .000

CONFIGURATION DESCRIPTION
 1A.8 - ARC 3.5 (8) - C931TER + TAV
 1A.8 - ARC 3.5 (9) - C931TER + TAV
 1A.8 - ARC 3.5 (9) - C931TER + TAV

DAT. OF SWAG
 1A.8 - ARC 3.5 (8) - C931TER + TAV
 1A.8 - ARC 3.5 (9) - C931TER + TAV
 1A.8 - ARC 3.5 (9) - C931TER + TAV

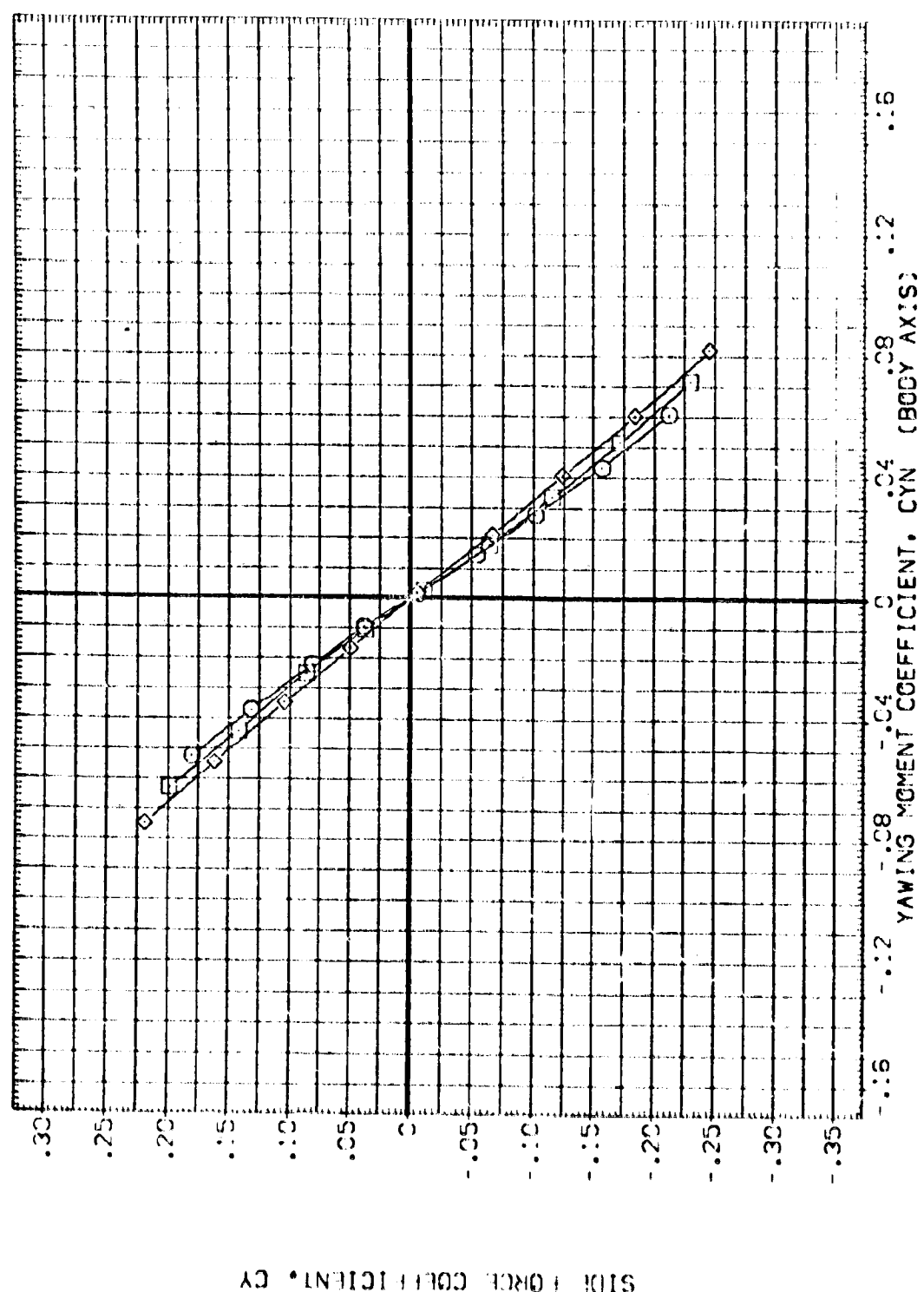
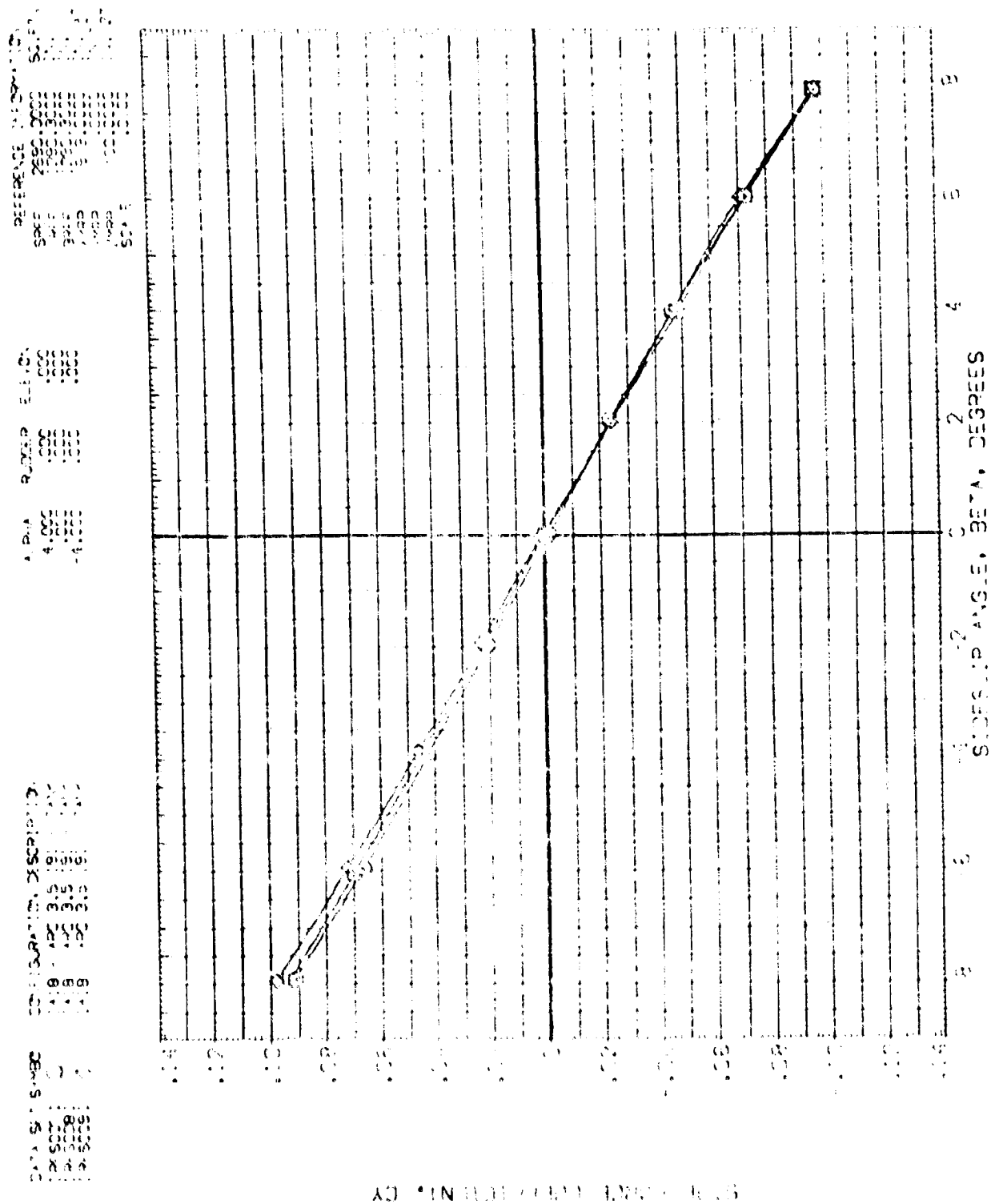


FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

(B)MAC = 7.32



THE UNIVERSITY OF CHICAGO

REFERENCE INFORMATION

50	100	200	300	400	500	600	700	800	900	1000
100	200	300	400	500	600	700	800	900	1000	1100
200	300	400	500	600	700	800	900	1000	1100	1200
300	400	500	600	700	800	900	1000	1100	1200	1300
400	500	600	700	800	900	1000	1100	1200	1300	1400
500	600	700	800	900	1000	1100	1200	1300	1400	1500
600	700	800	900	1000	1100	1200	1300	1400	1500	1600
700	800	900	1000	1100	1200	1300	1400	1500	1600	1700
800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000

1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000 31000 32000 33000 34000 35000 36000 37000 38000 39000 40000 41000 42000 43000 44000 45000 46000 47000 48000 49000 50000 51000 52000 53000 54000 55000 56000 57000 58000 59000 60000 61000 62000 63000 64000 65000 66000 67000 68000 69000 70000 71000 72000 73000 74000 75000 76000 77000 78000 79000 80000 81000 82000 83000 84000 85000 86000 87000 88000 89000 90000 91000 92000 93000 94000 95000 96000 97000 98000 99000 100000

1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000 31000 32000 33000 34000 35000 36000 37000 38000 39000 40000 41000 42000 43000 44000 45000 46000 47000 48000 49000 50000 51000 52000 53000 54000 55000 56000 57000 58000 59000 60000 61000 62000 63000 64000 65000 66000 67000 68000 69000 70000 71000 72000 73000 74000 75000 76000 77000 78000 79000 80000 81000 82000 83000 84000 85000 86000 87000 88000 89000 90000 91000 92000 93000 94000 95000 96000 97000 98000 99000 100000

1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000 31000 32000 33000 34000 35000 36000 37000 38000 39000 40000 41000 42000 43000 44000 45000 46000 47000 48000 49000 50000 51000 52000 53000 54000 55000 56000 57000 58000 59000 60000 61000 62000 63000 64000 65000 66000 67000 68000 69000 70000 71000 72000 73000 74000 75000 76000 77000 78000 79000 80000 81000 82000 83000 84000 85000 86000 87000 88000 89000 90000 91000 92000 93000 94000 95000 96000 97000 98000 99000 100000

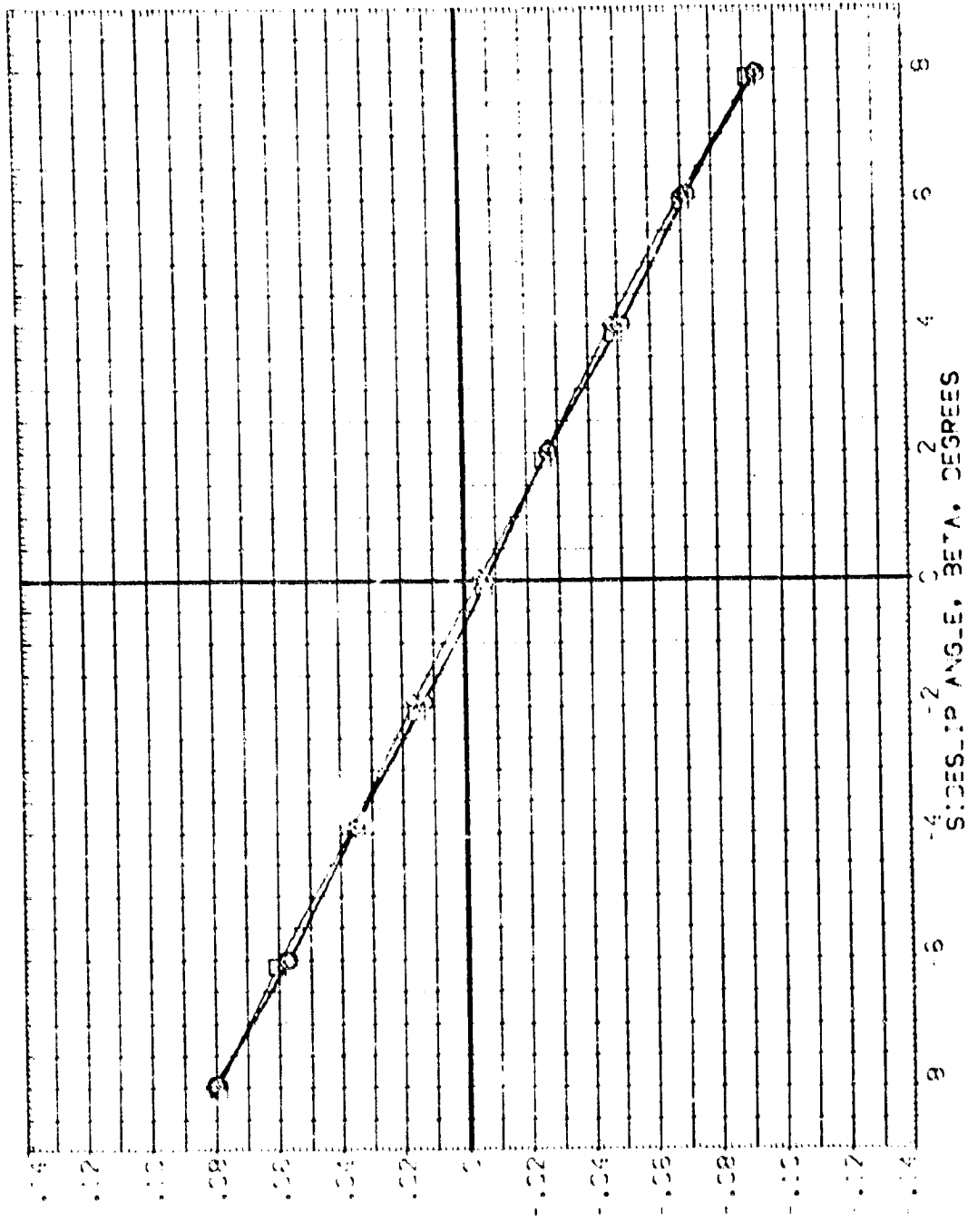


FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED WING LATERAL-DIRECTIONAL APP. CHAR.

SECRET

A-27A	60000
F	.00000
R-200R	.00000
E-LEV	.00000

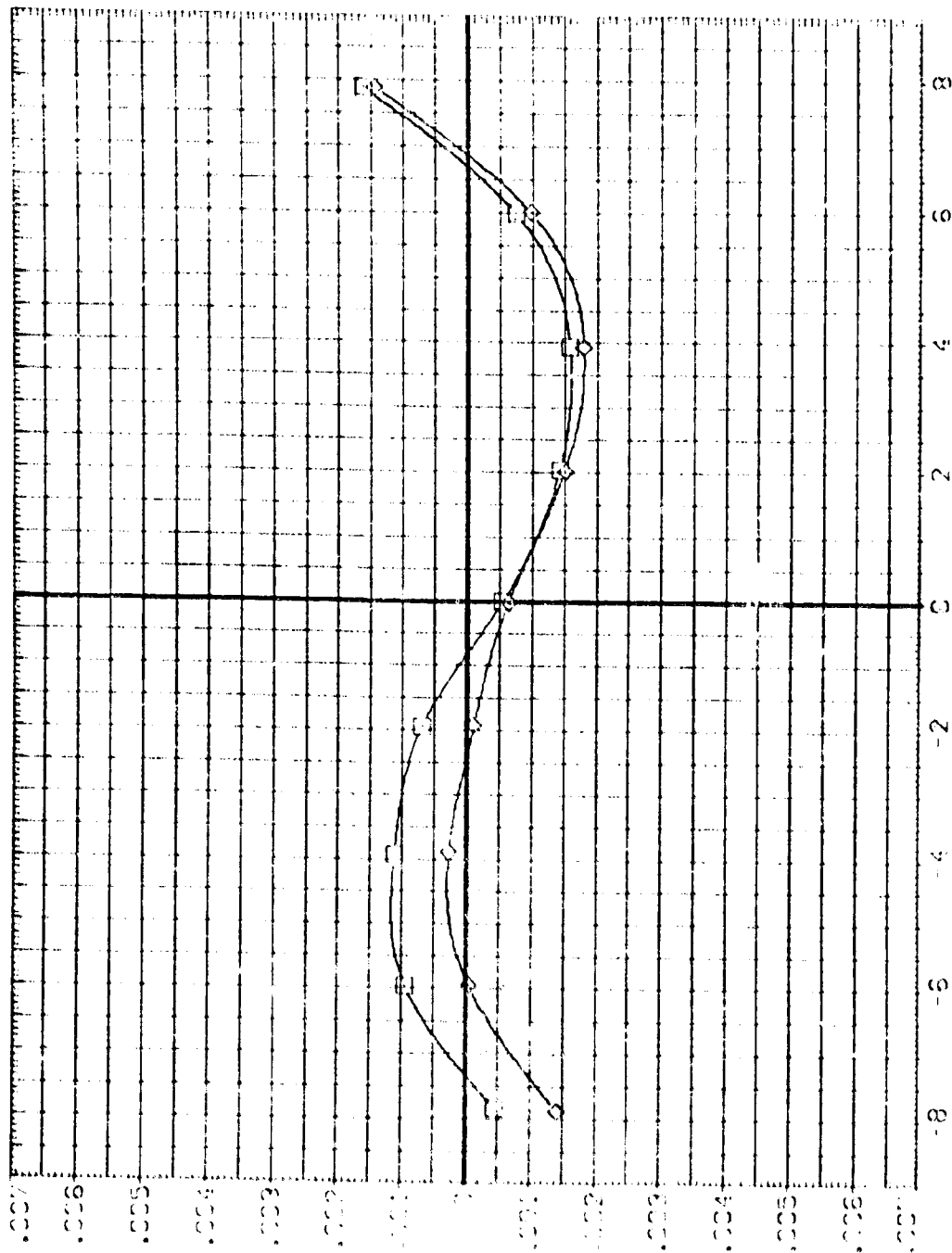
[illegible]

FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED EM LATERAL-DIRECTIONAL AERO. CHAR.

35.5.41

CONFIGURATION	DESCRIPTION
1A18	ARC 3.5
1A18	ARC 3.5
1A18	ARC 3.5

ALPHA	RIDER	E-6A
4.000	.000	.000
.000	.000	.000
-4.	.000	.000

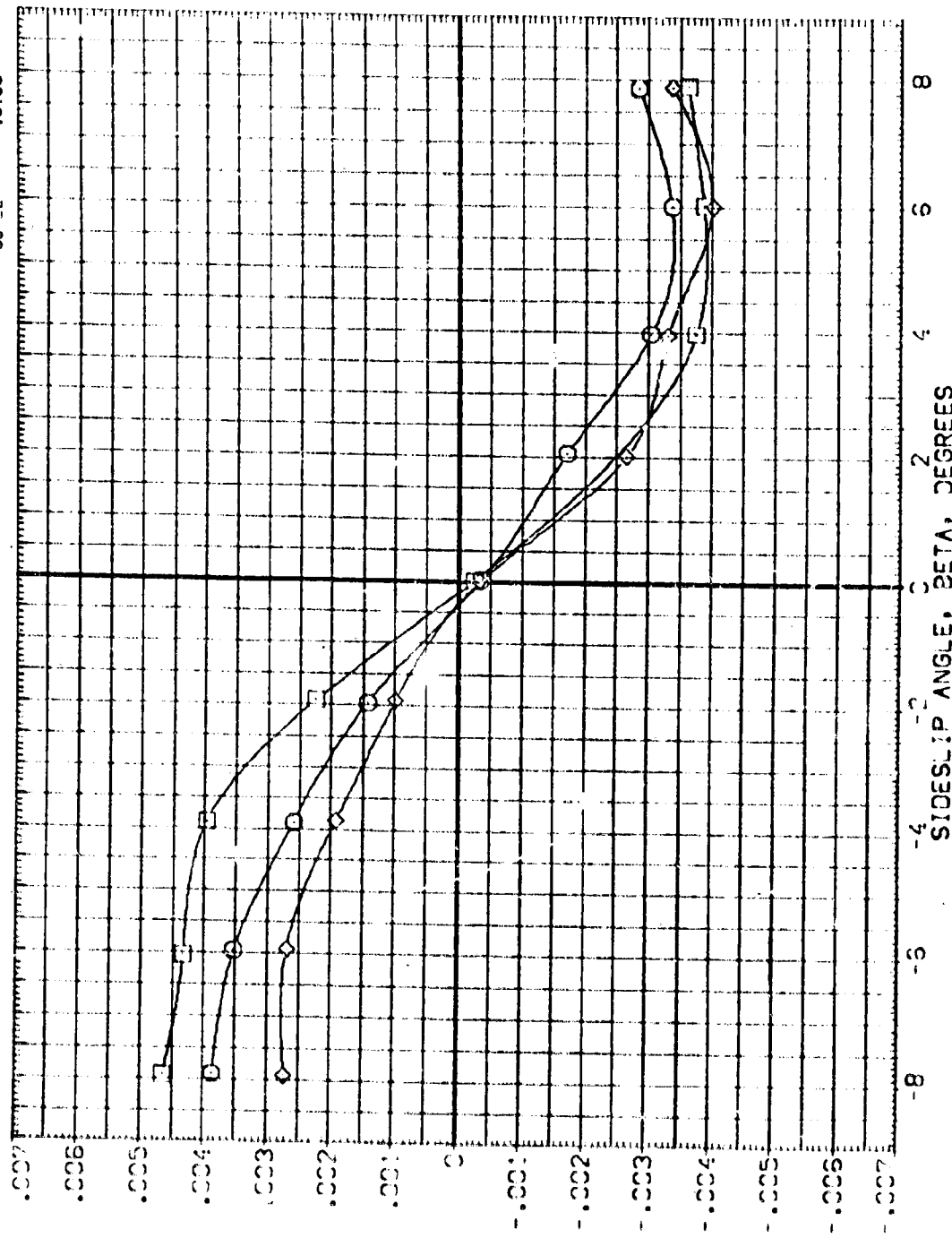
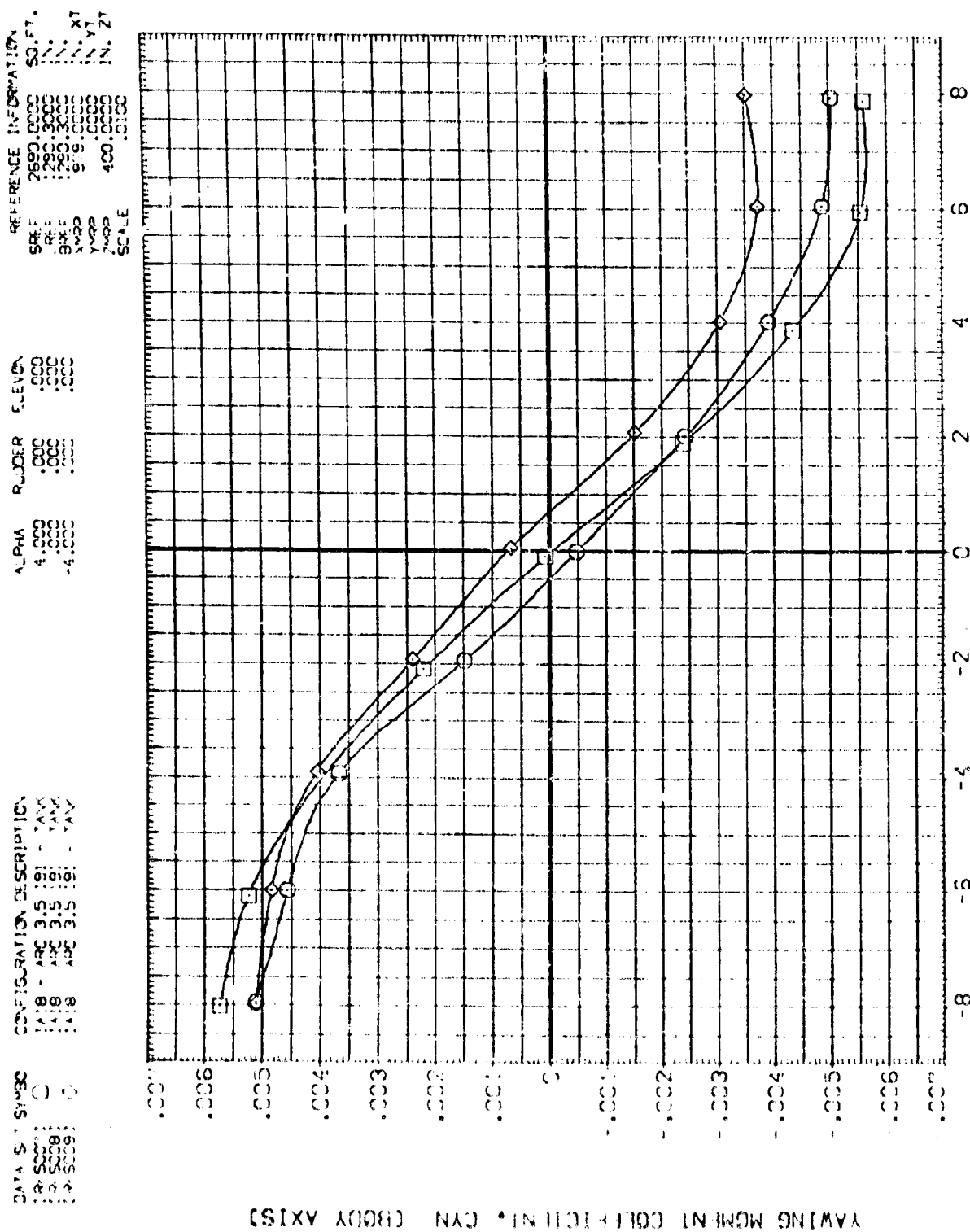
[illegible]

FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED BY LATERAL-DIRECTIONAL AERO. CHAR.



REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 REF 2690.0000
 BR-E 2690.0000
 XREF 2690.0000
 YREF 2690.0000
 ZREF 2690.0000
 SCALE 400.0000

ALPHA RUDDER ELEVON
 4.000 .000
 .000 .000
 -4.000 .000

CONFIGURATION DESCRIPTION
 DATA NOT AVAILABLE
 118 - APC 3.5 (9) - TANK
 118 - APC 3.5 (9) - TANK

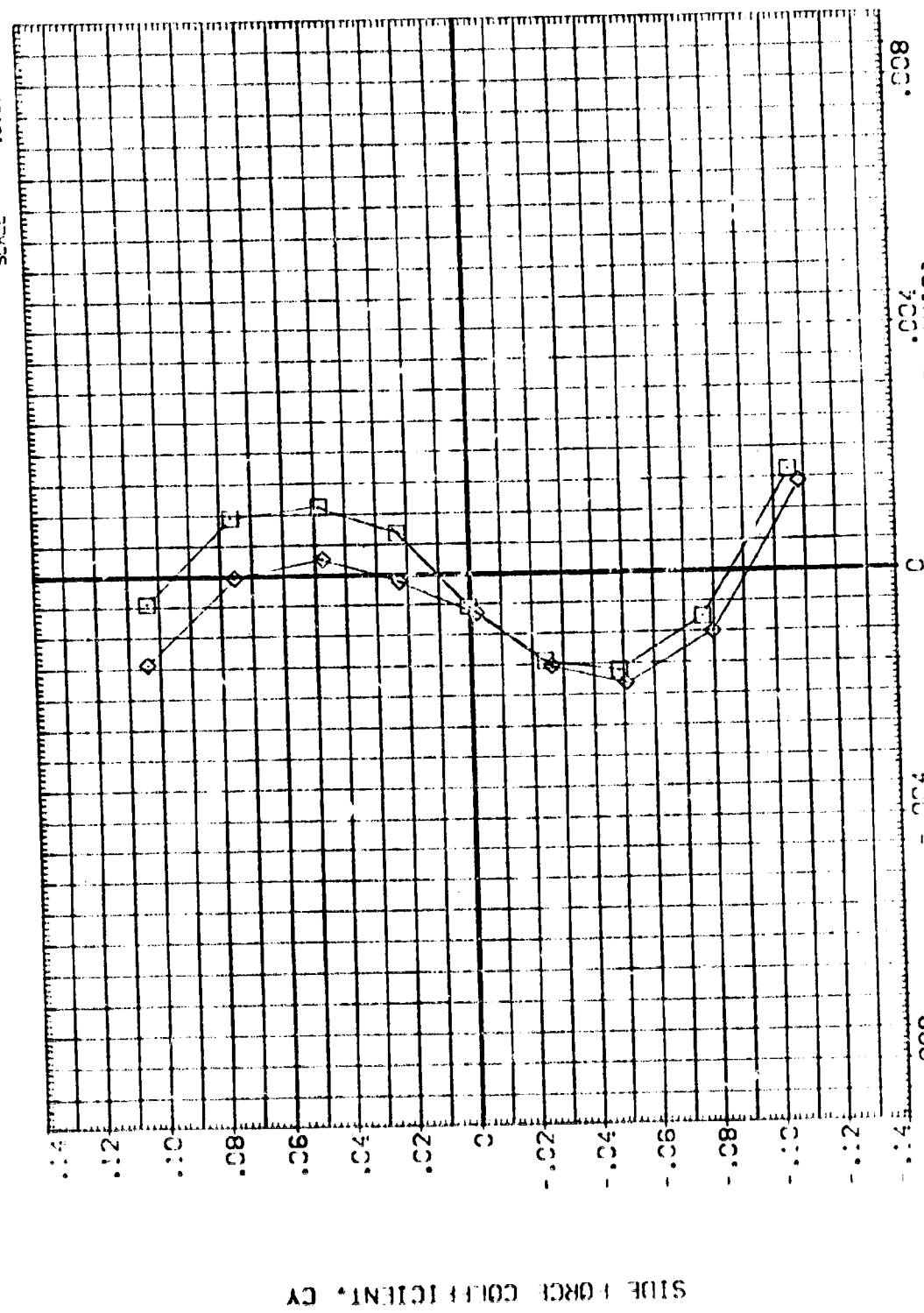


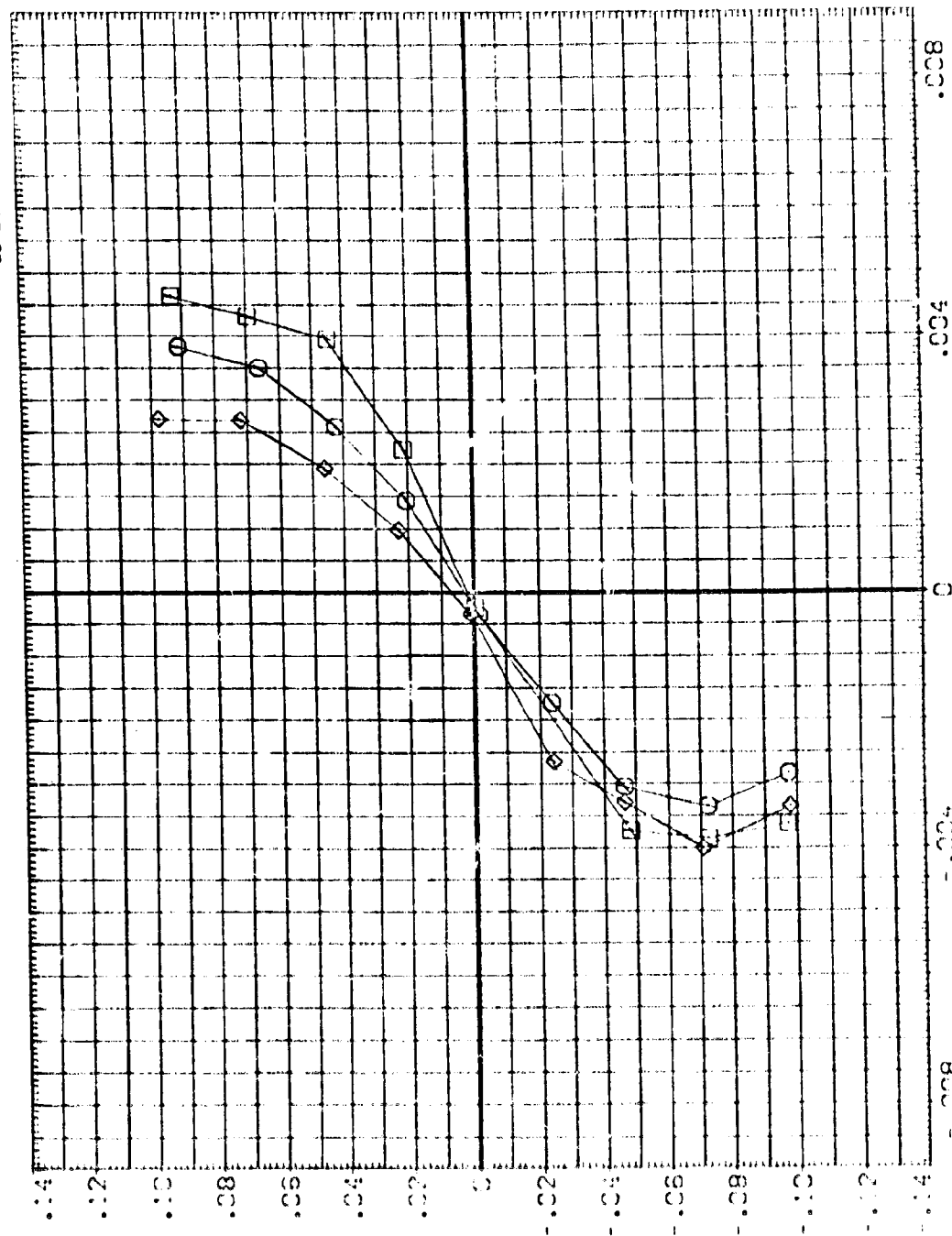
FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.
 CAVAC 5.29
 PAGE 35

REFERENCE INFORMATION
 SRE 2500.0000 SQ.FT.
 REF 1000.0000
 BR.F 1000.0000
 XWSP 1000.0000
 YWSP 1000.0000
 ZWSP 1000.0000
 SCALE 400.0000

ALPHA RUDDER ELEVON
 4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

CONFIGURATION DESCRIPTION
 118 - ARC 3.5 91 - TANK
 118 - ARC 3.5 91 - TANK
 118 - ARC 3.5 91 - TANK

DATA SET SYMBOL
 10000
 10000
 10000



YAWING MOMENT COEFFICIENT, C_{Y_N} (BODY AXIS)

FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.

ALPHA	RUDER	ELEVON
4.000	.000	.000
.000	.000	.000
-4.000	.000	.000

STATION	REFERENCE INFORMATION	DATE	TIME
12	0000	0000	0000
11	0000	0000	0000
10	0000	0000	0000
9	0000	0000	0000
8	0000	0000	0000
7	0000	0000	0000
6	0000	0000	0000
5	0000	0000	0000
4	0000	0000	0000
3	0000	0000	0000
2	0000	0000	0000
1	0000	0000	0000

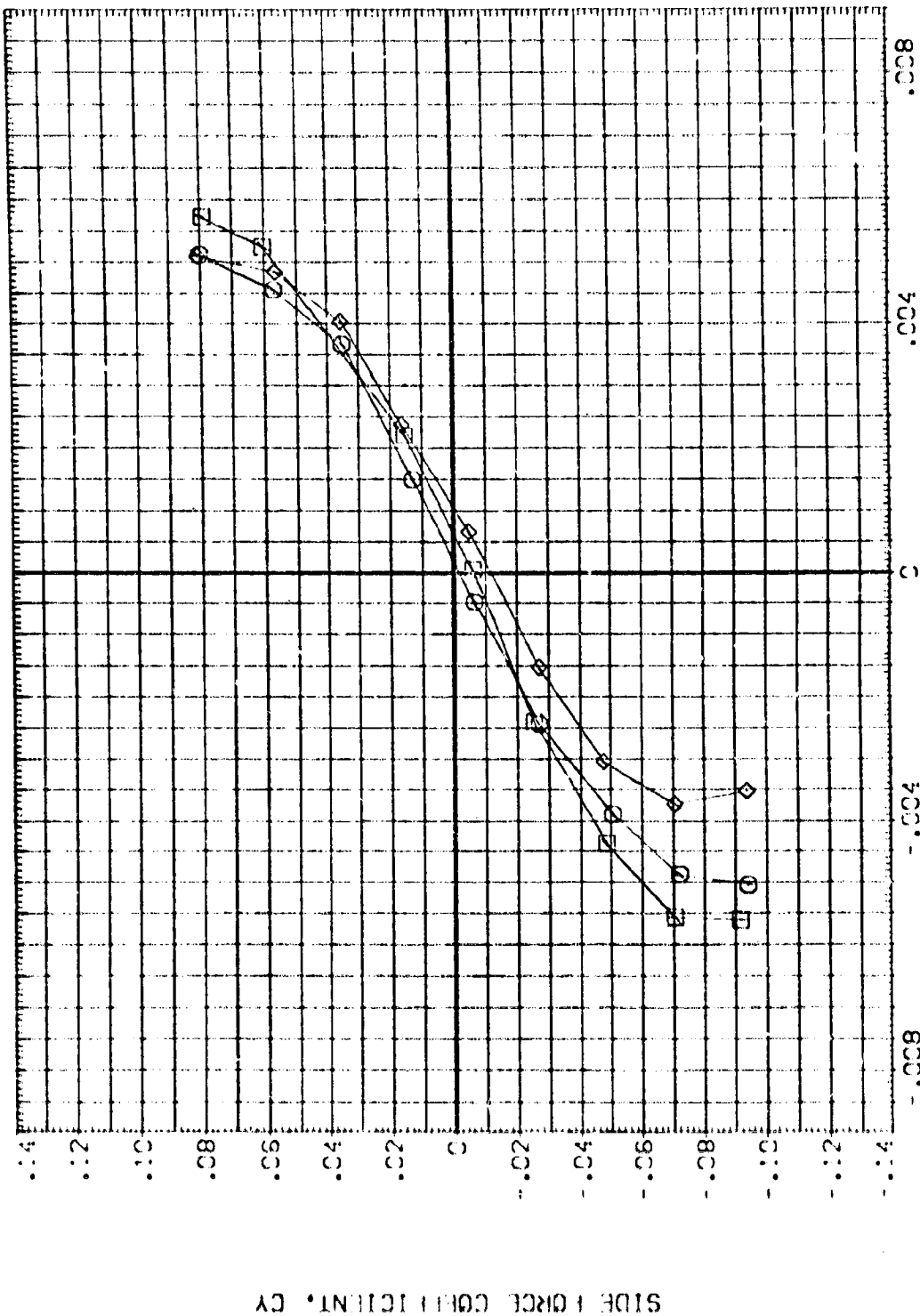


FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.

(C)MACH = 0.29

PAGE 37

BETA .000 RUDDER .000
ELEVON .000

PARAMETRIC VALUES

REFERENCE INFORMATION
SREF 2880.0000
LREF 1180.0000
BREF 1180.0000
XREF 9.00
YREF 1180.0000
ZREF 400.0000
SCALE 10.0000

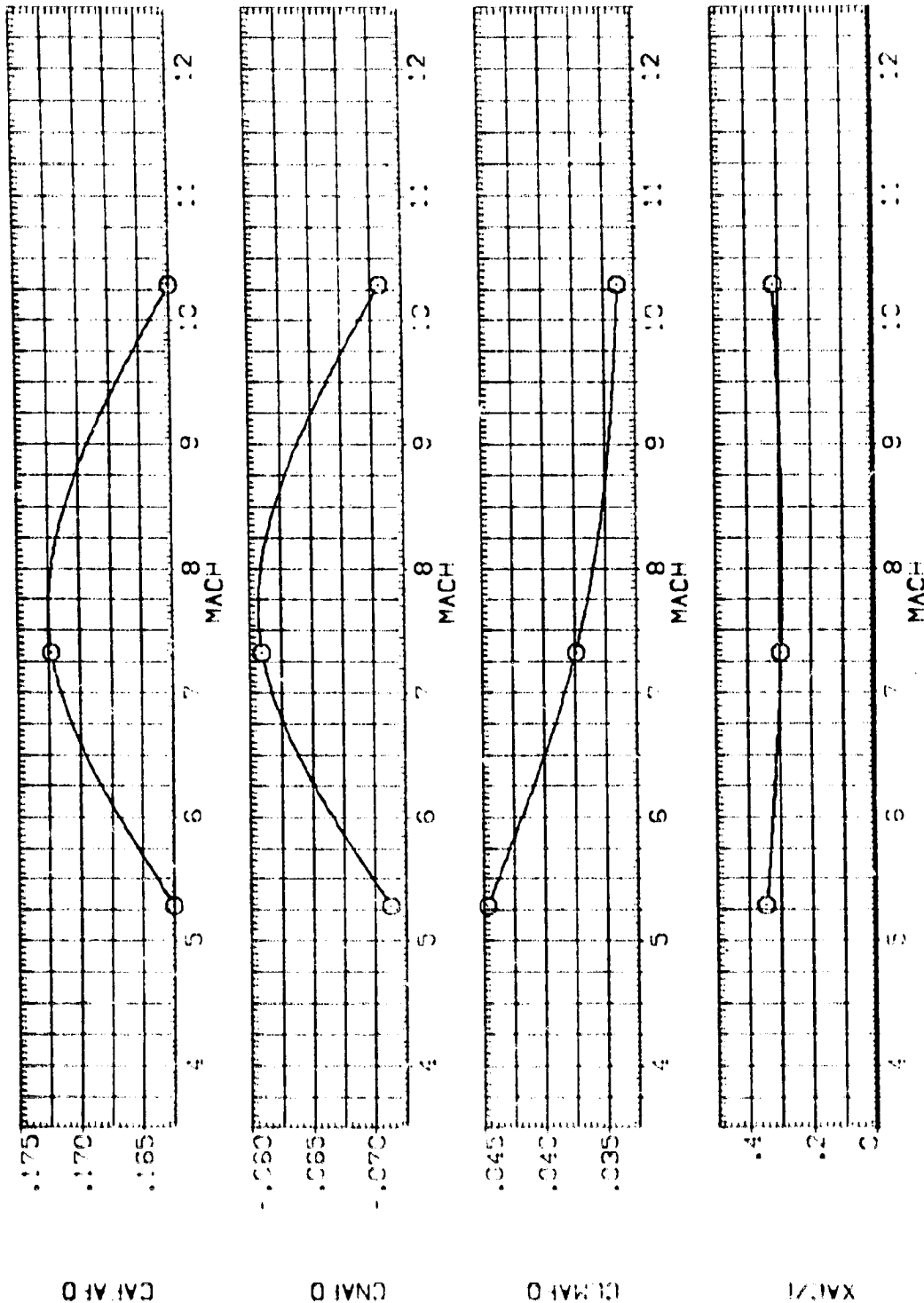


FIG. 8 SUMMARY OF SECOND STAGE LONGITUDINAL AERODYNAMIC CHARACTERISTICS.

(HES006)

ARC 3.5.19: - TAN

REFERENCE INFORMATION
 SQRT 2600.0000
 REF 2600.0000
 BREF 2600.0000
 X 2600.0000
 Y 2600.0000
 Z 2600.0000
 SCALE 400.0000

PARAMETRIC VALUES
 BETA .000
 RUDER .000
 FLUT .000

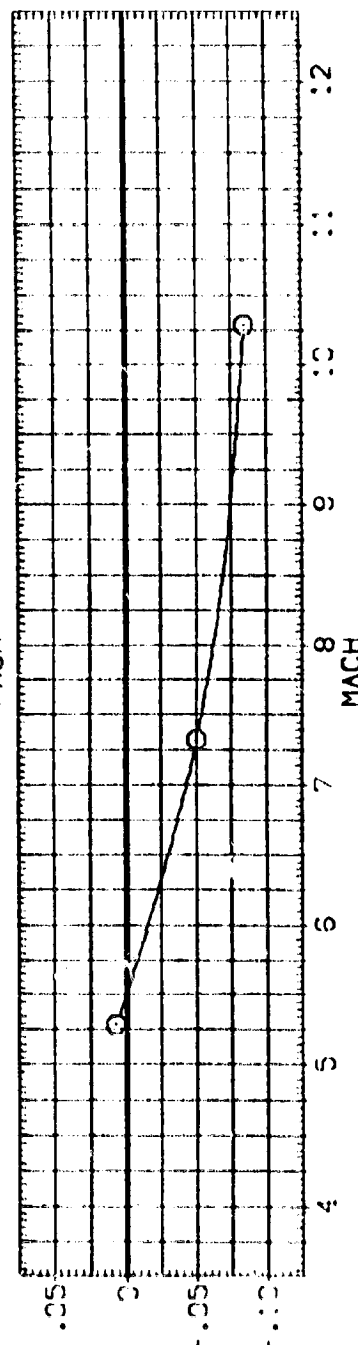
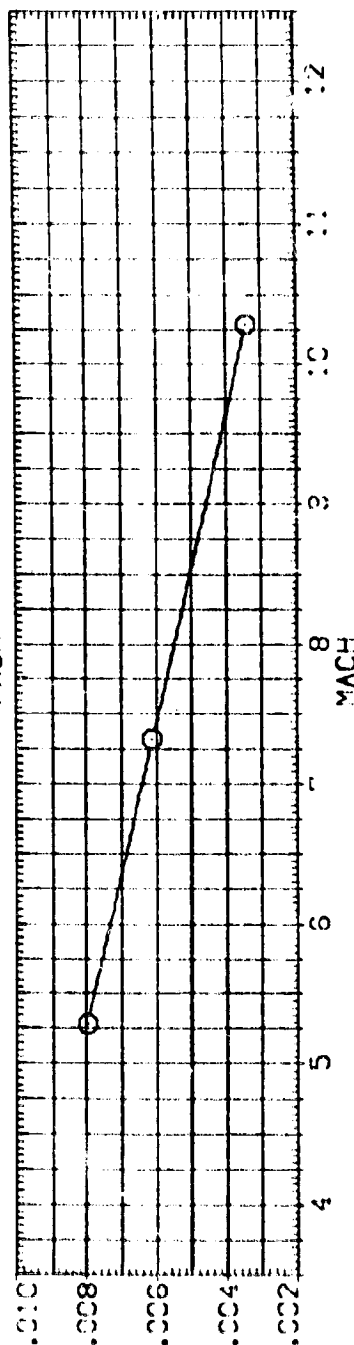
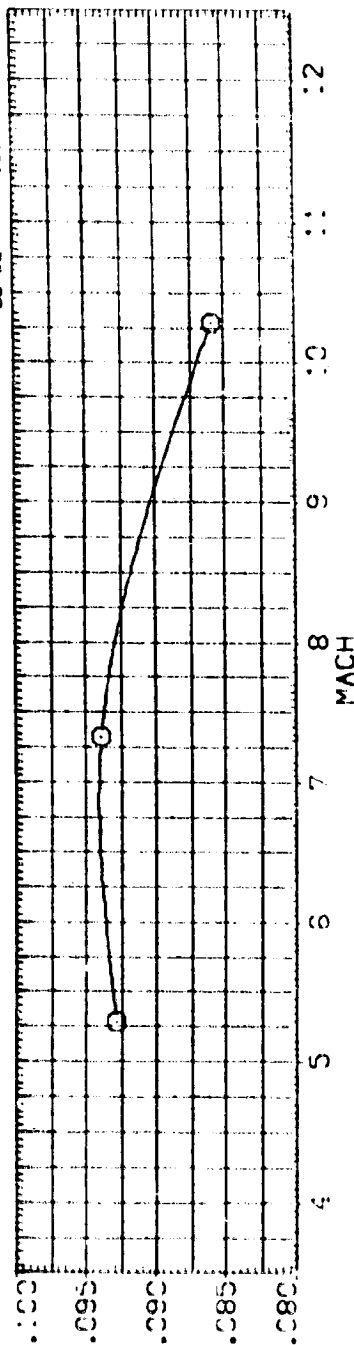


FIG. 9 SUMMARY OF ISOLATED ET LONGITUDINAL AERODYNAMIC CHARACTERISTICS.

DATA SET SYMBOL: SC08
 CONFIGURATION DESCRIPTION: A18 - ARC 3.5 91 - TANK
 SC09: A18 - ARC 3.5 91 - TANK
 SC09: A18 - ARC 3.5 91 - TANK

ALPHA: 4.000
 RUDDER: .000
 ELEVON: .000

REFERENCE INFORMATION:
 SIZE: 7500.0000
 REF: 7500.0000
 ELEV: 7500.0000
 X: 7500.0000
 Y: 7500.0000
 Z: 7500.0000
 SCALE: 400.0000

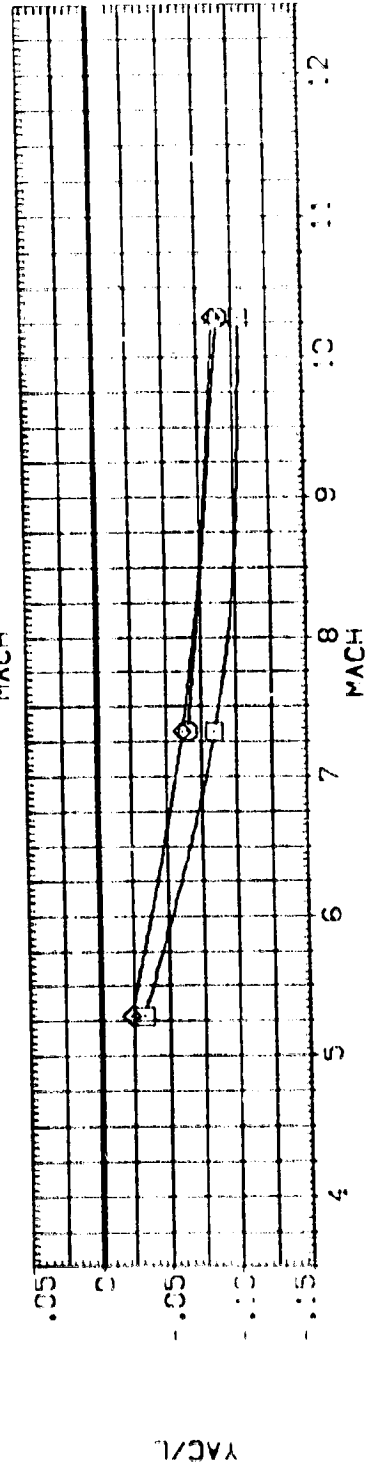
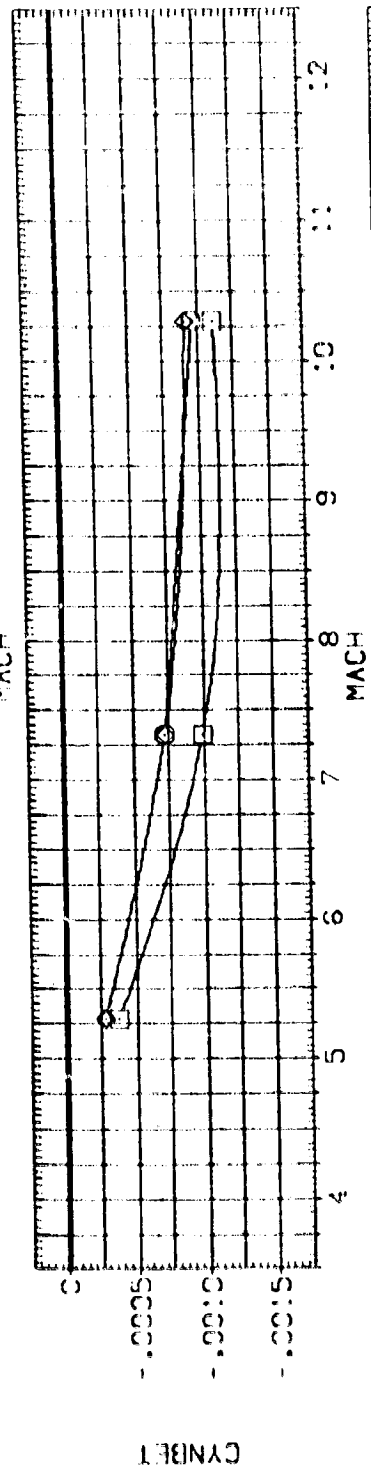
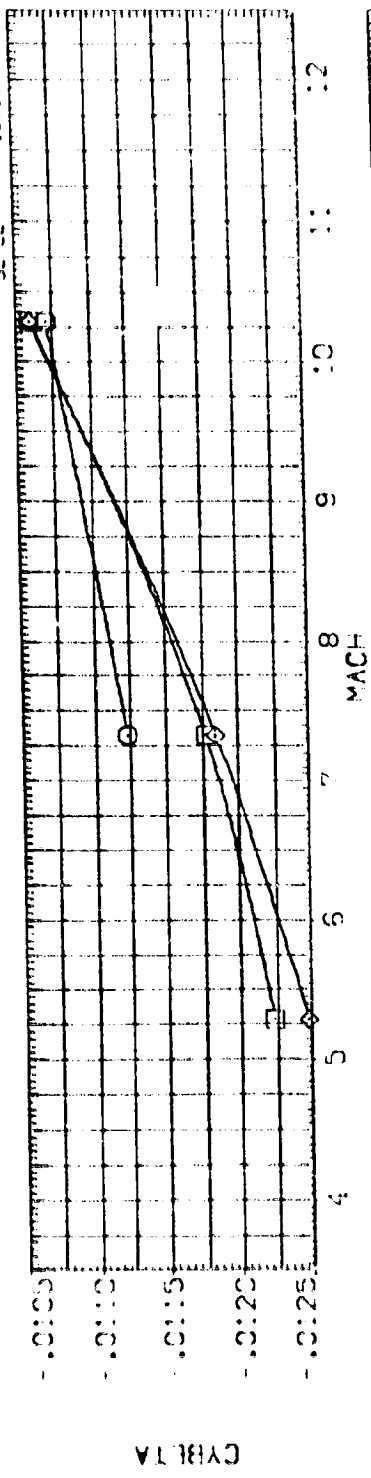


FIG. 11 SUMMARY OF ISOLATED ET LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS.

1A18 - ARC 3.5 :91 - ORBITER + TANK (NES012)
 SYMCL- C
 BETA .000
 ALPHA .000
 PARAMEIRIC VALUES
 .000 ELEVON
 .000
 DATA SOURCE
 MACH 5.300
 10.300
 DATASET NES012
 NES014
 .000
 REFERENCE INFORMATION
 SREF 2690.0000
 LREF 269.3000
 BREF 269.3000
 XREF 979.0000
 YREF 2000
 ZREF 400.0000
 SCALE .0100
 SQ.FT. X1
 Y1
 Z1

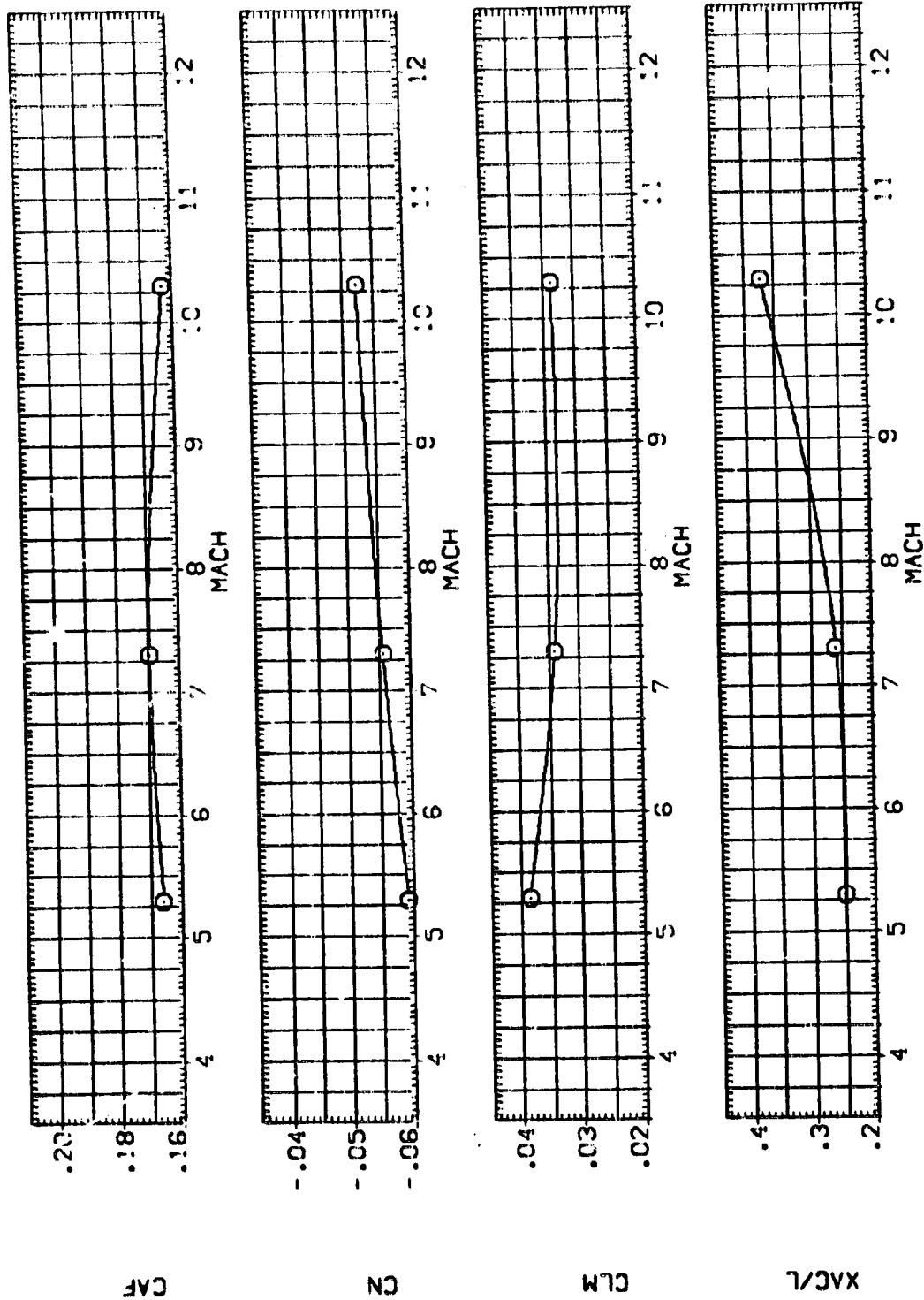


FIG. 12 SUMMARY OF SECOND STAGE LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

1A18 - ARC 3.5 19: - ORBITER - TAN (NES0:2)

SYMBOL	BETA	ALPHA	PARAMETRIC VALUES	DATA SOURCE	DATA SET	MACH	REF	SCALE
○	8.000		.000 ELEVON	NES0:2	5.300	7.300	2600.0000	SC.FT.
				NES0:13	5.300		2600.0000	
				NES0:14	5.300		2600.0000	
							97.9	XT
							97.9	YT
							400.0000	ZT
							400.0000	SCALE

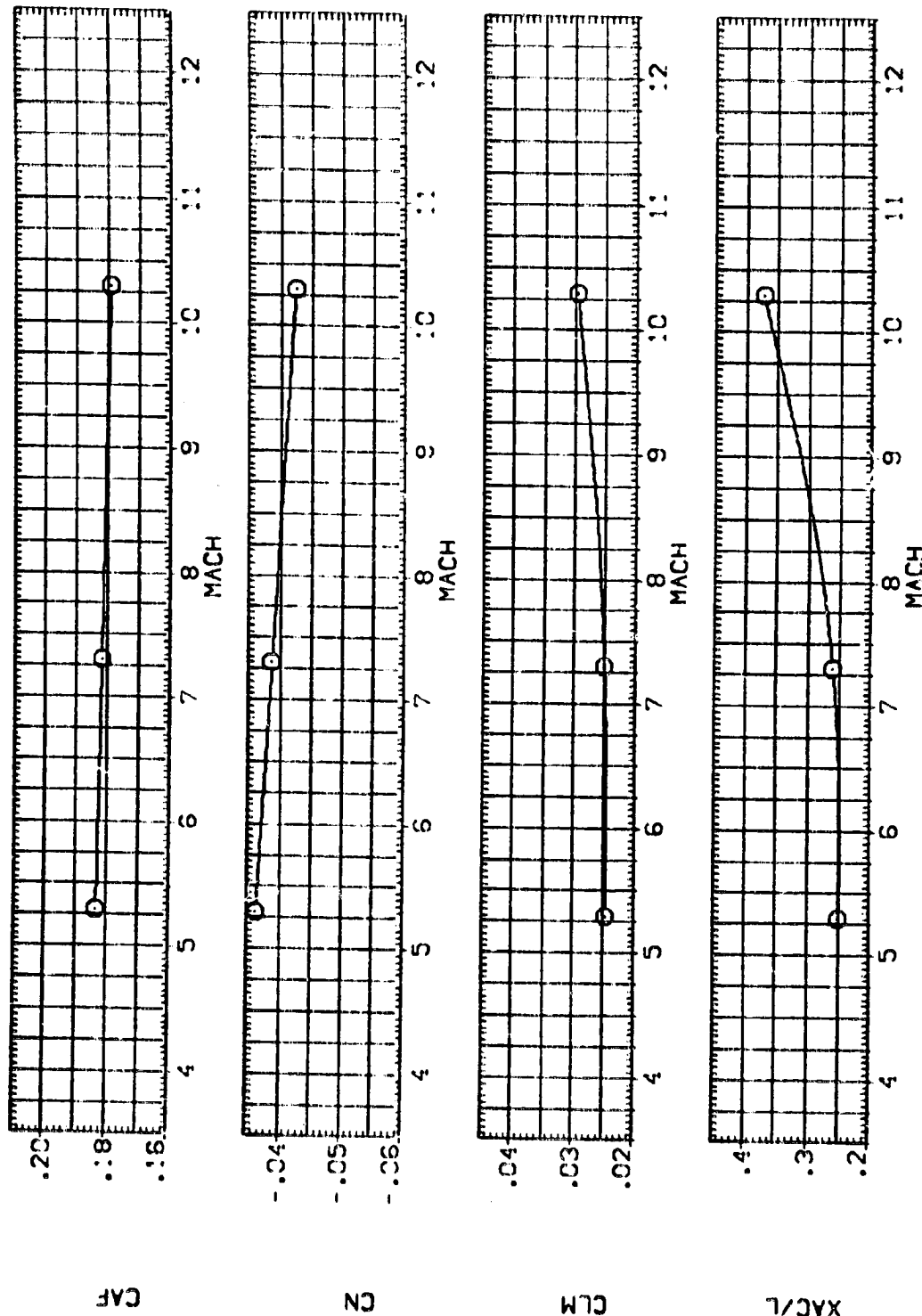


FIG. 12 SUMMARY OF SECOND STAGE LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

(NES017)

1A18 - ARC 3.5 191 - TANK

SYMBOL	BETA	ALPHA	PARAMETRIC VALUES		.000	DATASET	DATA SOURCE		REFERENCE INFORMATION	
○	-8.000		.000	ELEVON		NES017	MACH	MACH	SREF	SOL.T.
						NES019	5.300	7.300	2680.0000	1.000
							10.300		1250.0000	1.000
									1250.0000	1.000
									979.0000	1.000
									0.0000	1.000
									400.0000	1.000
									SCALE	

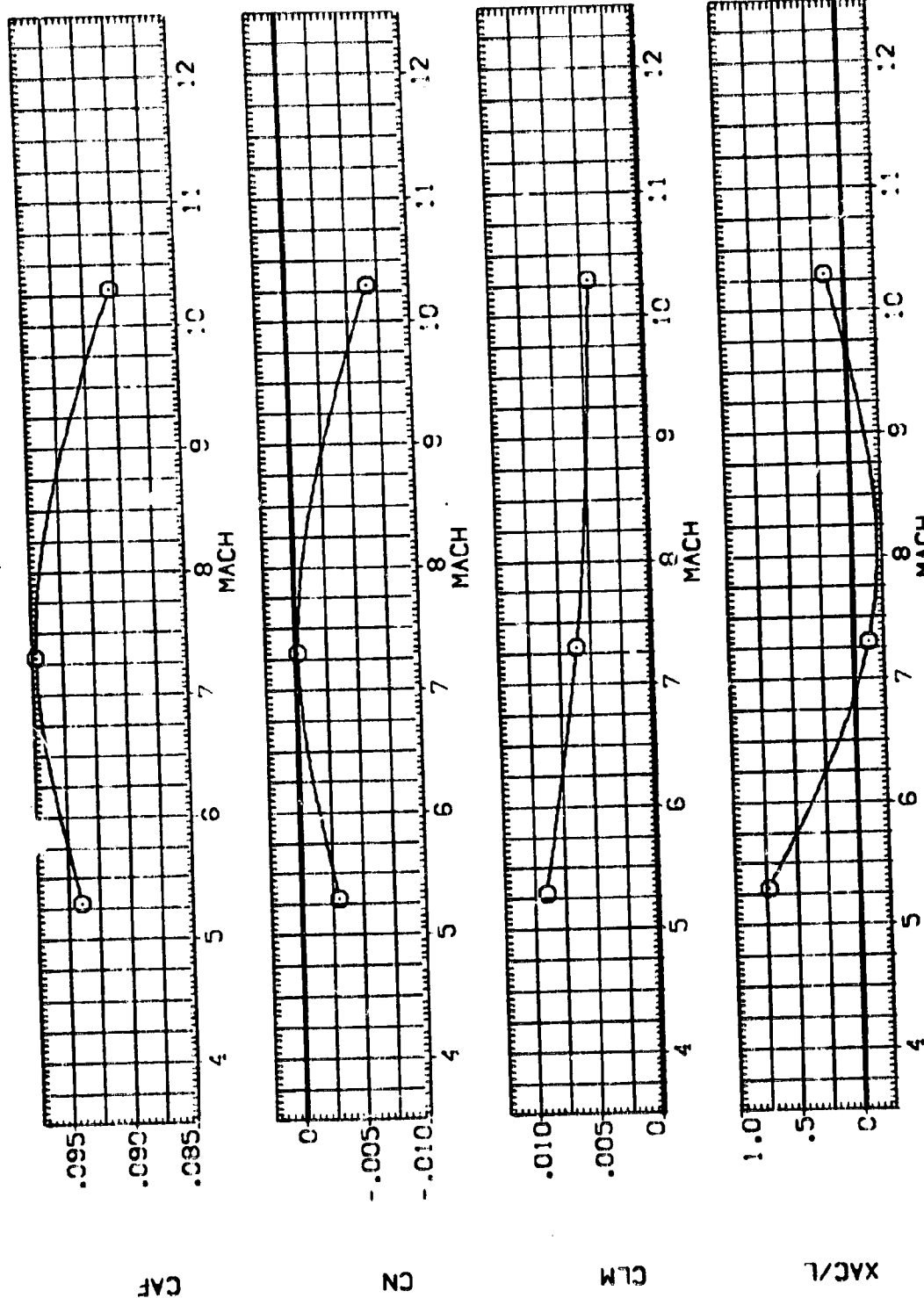


FIG. 13 SUMMARY OF ISOLATED ET LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

IA:8 -- ARC 3.5 :9: - TANK

(NES017)

SYMBOL	BETA	.000	ALPHA	.000	ELEVON	.000	DATASET	.000	DATA SOURCE	MACH	DATASET	MACH	SREF	2680.0000	SD.F.
0							NES017			5.300	NES018	7.300	LREF	2680.3000	
							NES019			10.300			BREF	2680.3000	
													X-REF	978.0000	X1
													Y-REF	0.0000	Y1
													Z-REF	400.0000	Z1
													SCALE	0.000	

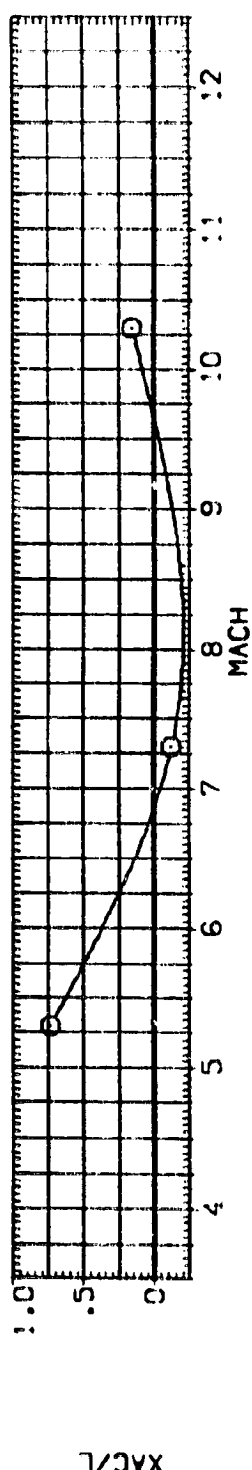
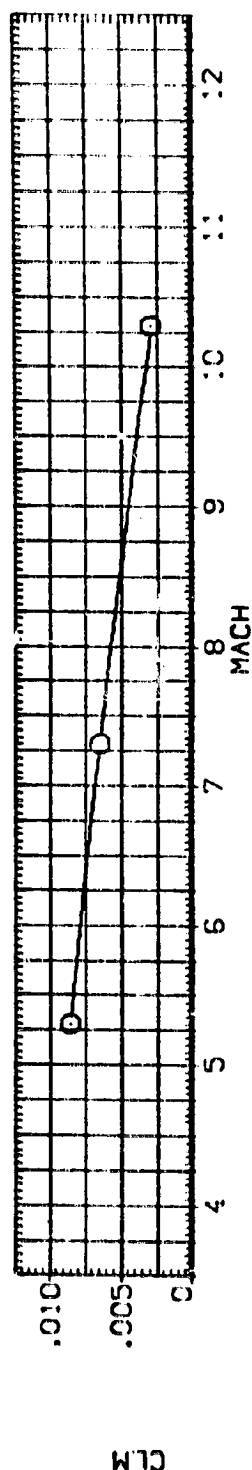
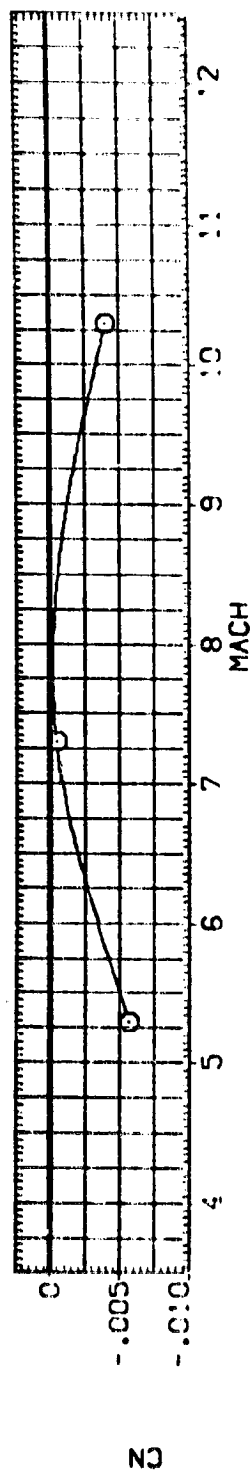
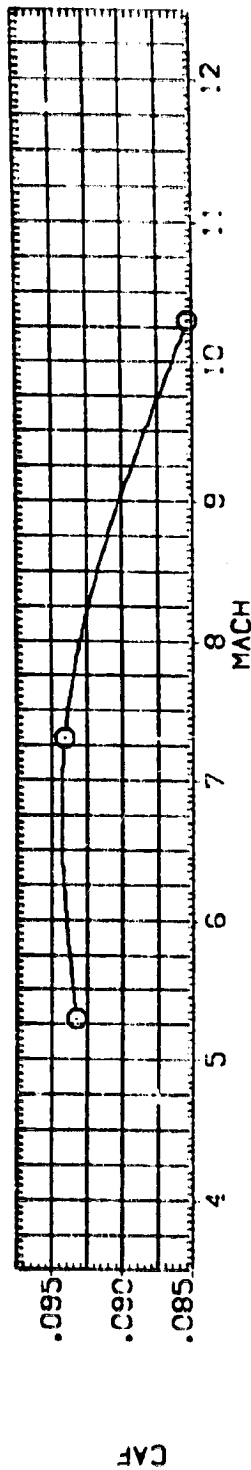


FIG. 13 SUMMARY OF ISOLATED ET LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

IA:8 - ARC 3.5 !9! - 'ANK

(LISEN)

SYMBOL	BETA	PARAMETRIC VALUES	DATA SOURCE	REFERENCE INFORMATION
○	8.000	.000 ALPH	MACH	SREF 2650.000
		.000 ELEV	DATASET	REF 120.000
			NEO17	SREF 120.000
			NEO18	REF 120.000
			NEO19	MAP 579.000
				MAP 579.000
				MAP 400.000
				MAP 400.000
				SCALE .0100

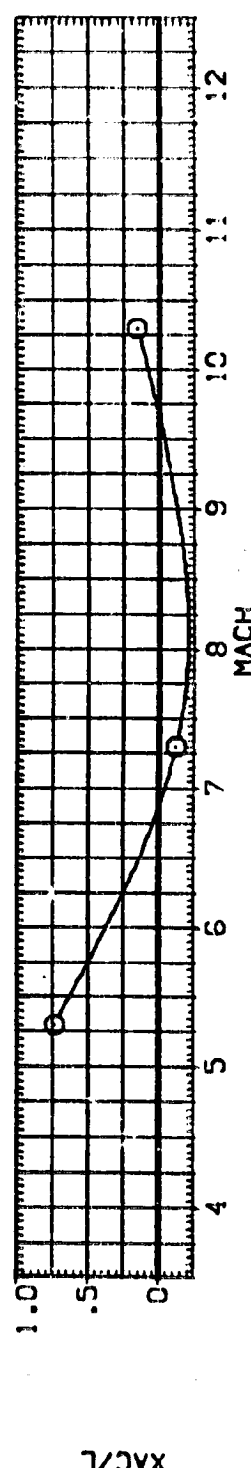
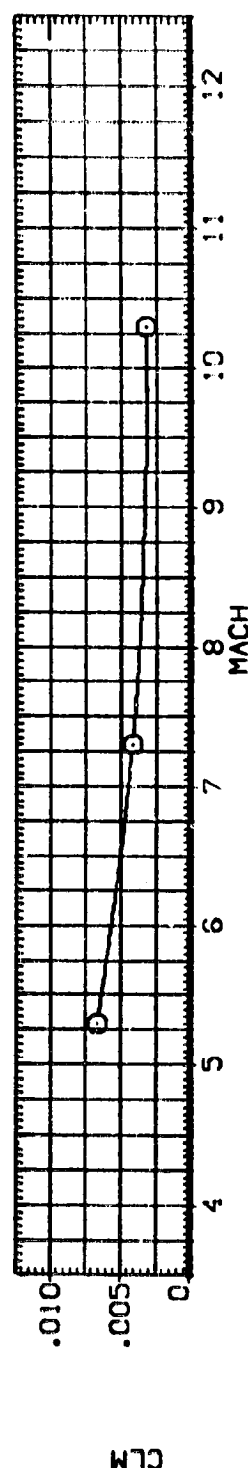
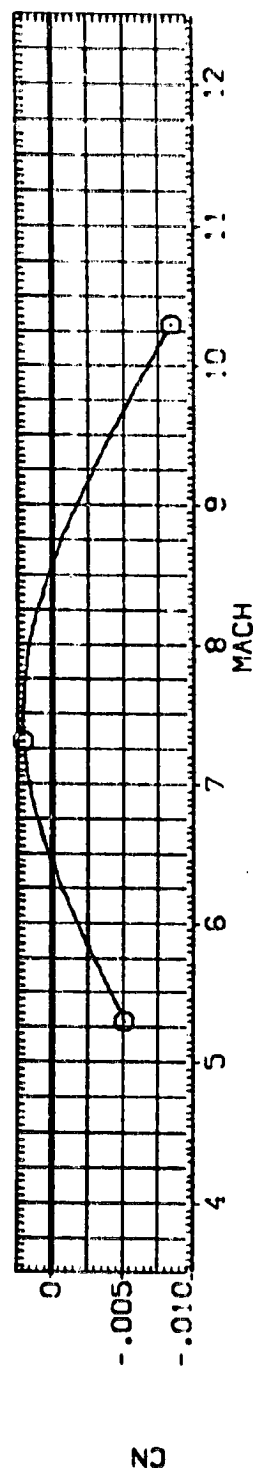
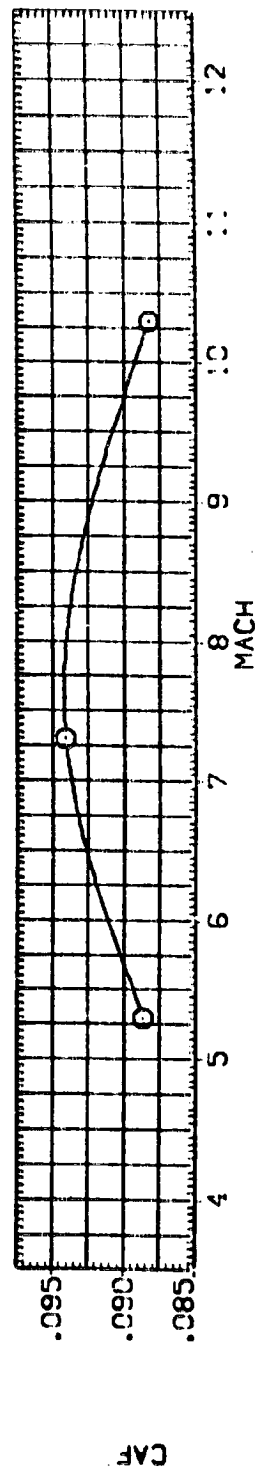


FIG. 13 SUMMARY OF ISOLATED ET LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

APPENDIX
TABULATED SOURCE DATA

Tabulations of plotted data are available on request
from Data Management Services.

DATE 08 MAR 75

TABULATED SOURCE DATA - ARC 3.5 191 (1A18)

PAGE 1

1A18 - ARC 3.5 191 - ORBITER + TANK

(RES001) (21 FEB 75)

REFERENCE DATA

SRP = 2899.9999 99. FT.
LRP = 1290.3000 IN.
BRP = 1290.3000 IN.
SCALE = .0100

XMRP = 979.0000 IN. X7
YMRP = .0000 IN. Y7
ZMRP = 490.0000 IN. Z7

BETA = .000 RUDDER = .000
ELEVON = .000

PARAMETRIC DATA

RUN NO. 0/ 0 RNVL = 2.65 GRADIENT INTERVAL = -5.00/ 5.00

	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CLL
7.320	-8.648	-.05982	-.26079	-.04032	.21216	.11164	.01453	-.00556
7.320	-6.416	-.05640	-.21198	-.03894	.19560	.09670	.01434	-.00517
7.320	-4.339	-.06034	-.17125	-.04033	.16001	.08047	.01393	-.00569
7.320	-2.284	-.06080	-.12273	-.03937	.17332	.06286	.01309	-.00584
7.320	-.165	-.05717	-.07496	-.03792	.16320	.04602	.01214	-.00568
7.320	1.900	-.05425	-.02826	-.03540	.15538	.03046	.01176	-.00578
7.320	3.901	-.04960	-.01560	-.03313	.14912	.01668	.01151	-.00574
7.320	6.050	-.04497	.06441	-.03005	.14259	.0014	.01043	-.00532
7.320	8.092	-.04219	.10916	-.02834	.13933	-.01563	.00993	-.00528
7.320	10.220	-.04038	.15695	-.02751	.13702	-.03438	.00987	-.00526
7.320	15.498	-.03829	.29141	-.03034	.12649	-.08211	.00787	-.00499
7.320	20.818	-.03403	.44703	-.02554	.12566	-.13718	.00231	-.00477
7.320	25.509	-.03464	.59194	-.03254	.12533	-.18918	.00881	-.00898
7.320	29.320	-.06891	.74804	-.04072	.12504	-.25808	.01082	-.00847
GRADIENT	.00134	.02222	.00088	-.00088	-.00437	-.00760	-.00030	-.00000

RUN NO. 0/ 0 RNVL = 2.74 GRADIENT INTERVAL = -5.00/ 5.00

	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CLL
7.320	-6.464	-.03124	-.24011	-.04069	.21768	.09497	.01458	-.00614
7.320	-6.250	-.02935	-.19309	-.03845	.20589	.08090	.01391	-.00529
7.320	-4.384	-.03050	-.15614	-.03837	.19506	.06865	.01292	-.00528
7.320	-2.142	-.02937	-.10550	-.03625	.18281	.05136	.01176	-.00525
7.320	-.024	-.02675	-.06144	-.03159	.17241	.03764	.00933	-.00448
7.320	1.913	-.02621	-.01950	-.03090	.16444	.02597	.00822	-.00435
7.320	3.851	-.02502	.01535	-.02820	.15675	.01874	.00743	-.00425
7.320	5.970	-.02256	.05774	-.02537	.14969	.00693	.00664	-.00405
7.320	8.012	-.02155	.10041	-.02420	.14281	-.00461	.00630	-.00404
7.320	10.106	-.02060	.14274	-.02099	.13776	-.01528	.00395	-.00325
7.320	15.284	-.01985	.26324	-.01821	.12795	-.05436	.00187	-.00213
7.320	20.418	-.01602	.39640	-.01617	.12122	-.09883	.00293	-.00350
7.320	24.893	-.01789	.54722	-.01848	.11835	-.16045	.00368	-.00307
7.320	28.557	-.01759	.68736	-.01984	.12008	-.21896	.00522	-.00495
GRADIENT	.00069	.02092	.00130	-.00130	-.00474	-.00562	-.00071	-.00014

DATE 06 MAR 75

FABULATED SOURCE DATA - ARC 3.5 191 (IA18)

PAGE 2

IA18 - ARC 3.5 191 - ORBITER + TANK

(RES001) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 SQ. FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RW/L = 1.92 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CBL
10.290	-8.471	-0.03195	-21892	-0.4867	-21299	.08131	.01136	-.00572
10.290	-6.269	-0.02981	-18656	-0.4676	-19988	.07278	.01094	-.00605
10.290	-4.401	-0.02963	-15977	-0.583	-19772	.06501	.01022	-.00576
10.290	-2.202	-0.02551	-11463	-0.3391	-17378	.04973	.00803	-.00512
10.290	-1.126	-0.02338	-07299	-0.3495	-16315	.03460	.00692	-.00482
10.290	1.811	-0.01933	-03819	-0.2743	-15406	.02515	.00431	-.00359
10.290	3.771	-0.01763	-00073	-0.2547	-14697	.01562	.00435	-.00382
10.290	5.841	-0.01089	.03441	-0.0615	-14227	.01339	.00310	-.00254
10.290	7.908	-0.00825	.08134	-0.01377	-13468	.00257	.00383	-.00253
10.290	9.953	-0.00751	.11719	-0.01231	-12894	-.00585	.00328	-.00228
10.290	15.048	-0.00426	.22836	-0.05533	-12102	-.04010	.00045	-.00079
10.290	20.154	-0.00332	.35007	-0.0492	-11497	-.07958	.00095	-.00075
10.290	24.611	-0.00295	.49908	-0.0443	-11593	-.13973	.00101	-.00058
10.291	28.241	-0.00227	.63906	-0.0337	-12087	-.20075	.00065	-.00045
GRADIENT		.00153	.01953	.00261	-.00499	-.00607	-.00076	.00027

IA18 - ARC 3.5 191 - ORBITER + TANK

(RES002) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 SQ. FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = 4.000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RW/L = 3.18 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
5.291	-7.741	-.04274	-.20844	-.07015	.03055	3.98527	.17571	.00195
5.291	-5.837	.03928	.15040	-.05087	.02224	3.99227	.16781	.00564
5.291	-3.785	.03571	.09174	-.03039	.01360	3.99734	.16072	.00838
5.291	-1.911	.03242	.04287	-.01358	.00532	3.99925	.15344	.01087
5.291	.030	.03199	-.00583	-.00249	-.00109	4.00045	.14905	.01141
5.291	1.945	.03845	-.05751	.01914	-.00893	4.00611	.15266	.00746
5.291	3.842	.04053	-.11097	.03824	-.01700	4.00485	.15662	.00569
5.291	5.810	.05120	-.16876	.05472	-.02358	4.01234	.15998	-.00098
5.291	7.630	.09969	-.22772	.07481	-.03457	4.01648	.16339	-.00677
GRADIENT		.00082	-.02647	.00059	-.00400	.00115	-.00047	-.00046

DATE 06 MAR 75

TABULATED SOURCE DATA - ARC 3.5 191 (1A10)

PAGE 3

1A10 - ARC 3.5 191 - ORBITER + TANK (RES002) (21 FEB 75)

REFERENCE DATA

REF = 2000.0000 90. FT. YARP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YARP = .0000 IN. YT
 REF = 1290.3000 IN. ZARP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = 4.000 RUPPER = .000
 ELEVON = .000

RUN NO. 0/ 0 RVL = 2.70 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CB	ALPHA	CAF	CLM
7.320	-7.799	.03278	.18032	-.05277	.02508	3.98618	.16158	.00398
7.320	-5.890	.03024	.13044	-.03705	.01789	3.98901	.15898	.00737
7.320	-3.881	.02217	.08025	-.02205	.01062	3.98735	.15659	.01297
7.320	-1.947	.02346	.03728	-.00939	.01471	3.99267	.15456	.01458
7.320	-.003	.02286	-.00577	.00149	-.00108	3.99294	.15602	.01568
7.320	1.966	.02808	-.05396	.01433	-.00811	3.99404	.15607	.01169
7.320	3.929	.03053	-.10270	.02792	-.01511	3.99447	.15912	.01055
7.320	5.946	.03531	-.15662	.04347	-.02284	3.99442	.16159	.00687
7.320	7.799	.04152	-.21245	.06084	-.03119	3.99564	.16143	.00305
GRADIENT		.00109	-.02341	.00633	-.00329	.00080	.00034	-.00040

RUN NO. 0/ 0 RVL = 1.49 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CB	ALPHA	CAF	CLM
10.290	-7.886	.02153	.15397	-.04211	.01933	3.99565	.16309	.00989
10.290	-5.943	.01029	.10821	-.02885	.01388	3.98352	.15702	.01644
10.290	-3.892	.01793	.06975	-.01742	.00901	3.98955	.15127	.01445
10.290	-1.910	.00585	.02728	-.00632	.00317	3.98656	.14754	.02079
10.290	.047	.01322	-.01074	.00192	-.00182	3.99043	.14754	.01773
10.290	2.054	.01925	-.05137	.01188	-.00759	3.99296	.14807	.01478
10.290	3.929	.02440	-.09337	.02298	-.01375	3.99489	.15083	.01263
10.291	5.967	.02873	-.14051	.03772	-.02078	3.99501	.15444	.00984
10.290	7.824	.03453	-.18607	.05123	-.02737	3.99573	.15813	.00622
GRADIENT		.00143	-.02065	.00505	-.00287	.00587	-.00002	-.00049

DATE 98 MAR 75

TABULATED SOURCE DATA - ARC 3.5 191 (IA18)

PAGE 4

(RES003) (21 FEB 75)

REFERENCE DATA

SREF = 2890.0000 SQ.FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

IA18 - ARC 3.5 191 - ORBITER + TANK

PARAMETRIC DATA

ALPHA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RN/L = 3.08 GRADIENT INTERVAL = -5.00/ 5.00
 MACH 5.291 BETA -7.714 CN -.06545 CY .22478 CYN -.07716 CBL .03065 ALMA -.22754 CAF .19591 CLM .03635
 5.291 -5.831 -.06538 .16273 -.09489 .02245 -.01617 .18669 .03922
 5.291 -3.793 -.06683 .10089 -.03340 .01382 -.20997 .17910 .04022
 5.291 -1.896 -.06599 .04413 -.01418 .09562 .20158 .17222 .04083
 5.291 -.010 -.06350 -.08003 .00260 -.00143 -.19360 .16723 .04013
 5.291 1.930 -.05990 -.06594 .02098 -.00985 .19037 .17057 .03857
 5.291 5.757 -.05043 -.18404 .06195 -.02669 -.18713 .17840 .03229
 5.291 7.550 -.04283 -.24586 .03570 -.18421 .18316 .02740
 GRADIENT .00122 -.02900 .00942 -.00410 .00324 -.00160 -.00300

RUN NO. 0/ 0 RN/L = 2.84 GRADIENT INTERVAL = -5.00/ 5.00
 MACH 7.320 BETA -7.850 CN -.05810 CY .19897 CYN -.06326 CBL .02603 ALMA -.11102 CAF .18603 CLM .02989
 7.320 -5.922 -.05974 .14149 -.04410 .01830 -.10830 .18002 .03329
 7.320 -3.879 -.05963 .08616 -.02487 .01028 -.10385 .17376 .03433
 7.320 -1.914 -.05955 .03723 -.01049 .00414 -.10155 .17029 .03481
 7.320 .027 -.03741 -.01192 .00269 -.00197 -.09880 .17024 .03457
 7.320 1.983 -.05388 -.06804 .01758 -.00905 -.16990 .03320 .03217
 7.320 3.939 -.05081 -.11610 .03360 -.01641 -.17370 .03217 .02805
 7.320 5.936 -.04437 -.17136 .05155 -.02437 .17799 .02805 .02582
 7.320 7.858 -.04100 -.23053 .07183 -.03285 -.18203 .02582
 GRADIENT .00119 -.02595 .00742 -.00341 .00125 -.00000

RUN NO. 0/ 0 RN/L = 1.73 GRADIENT INTERVAL = -5.00/ 5.00
 MACH 10.291 BETA -7.919 CN -.05440 CY .17258 CYN -.03277 CBL .02212 ALMA -.07032 CAF .17843 CLM .03172
 10.290 -5.957 -.05291 .12578 -.03705 .01602 -.06727 .17274 .03159
 10.290 -3.903 -.05631 .08087 -.02304 .01042 -.06599 .16724 .03435
 10.290 -1.963 -.05026 .03147 -.00816 .00326 -.06285 .16452 .03102
 10.290 -.006 -.05324 -.01045 .00327 -.00193 -.06224 .16378 .03406
 10.290 1.993 -.04536 -.05918 .01684 -.00897 .05963 .16460 .02956
 10.290 3.931 -.04172 -.10807 .03062 -.01584 .05790 .16801 .02876
 10.290 5.989 -.04142 -.15858 .04601 -.02260 .05890 .17515 .02944
 10.290 7.860 -.04324 -.21299 .06413 -.03060 .06139 .17936 .02994
 GRADIENT .00174 -.02387 .00574 -.00330 .00099 .00000



DATE 08 MAR 73

TABULATED SOURCE DATA - ARC 3.5 191 (1A10)

(RES004) (21 FEB 72)

1A10 - ARC 3.5 191 - ORBITER + TANK

REFERENCE DATA

SRP = 2000.0000 SQ. FT. YMRP = 979.0000 IN. XT
LREF = 1290.3000 IN. YMRP = .0000 IN. YT
BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
SCALE = .0100

PARAMETRIC DATA

ALPHA = -4.000 RUDDER = .000
ELEVON = .000

RUN NO. 0/ 0 RV/L = 3.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
5.291	-7.632	-1.6032	.24596	-.08796	.03303	-4.40901	.21655	.07091
5.291	-3.751	-.19988	.17691	-.06194	.02374	-4.39759	.20674	.07133
5.291	-3.787	-.15847	.11009	-.03776	.01442	-4.38851	.19945	.07156
5.291	-1.893	-.15689	.05062	-.01719	.00636	-4.38128	.19257	.07136
5.291	.006	-.15494	-.00949	.00344	-.00101	-4.37785	.18817	.07038
5.291	1.956	-.15225	-.07254	.02591	-.01048	-4.37297	.19170	.08959
5.291	3.803	-.15239	-.13729	.04795	-.01978	-4.37483	.19468	.06942
5.291	5.798	-.14708	-.21064	.07535	-.02993	-4.37489	.20034	.08571
5.291	7.653	-.14199	-.28167	.10247	-.03993	-4.37489	.20512	.08210
GRADIENT		.00088	-.03247	.01122	-.00449	.00182	-.00055	-.00032

RUN NO. 0/ 0 RV/L = 2.36 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
7.320	-7.814	-.14590	.21896	-.07470	.02776	-4.19556	.20236	.06091
7.320	-5.910	-.14600	.16134	-.05473	.01999	-4.19239	.19845	.06256
7.320	-3.889	-.14945	.10331	-.03469	.01222	-4.19317	.19709	.06482
7.320	-1.942	-.14442	.04897	-.01635	.00545	-4.18690	.19421	.06348
7.320	-.012	-.14506	-.00636	.00187	-.00149	-4.18771	.19139	.06374
7.320	1.982	-.14278	-.06679	.02115	-.00325	-4.18405	.19470	.06423
7.320	3.923	-.14420	-.12484	.04062	-.01711	-4.18583	.19676	.06465
7.320	5.913	-.14271	-.18444	.06732	-.02529	-4.18736	.20098	.06339
7.320	7.796	-.13921	-.24626	.09223	-.03415	-4.18855	.20539	.06267
GRADIENT		.00062	-.02926	.00963	-.00375	.00090	-.00000	.00001

RUN NO. 0/ 0 RV/L = 1.45 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
10.290	-7.869	-.13493	.18506	-.06148	.02184	-4.12451	.20205	.05902
10.290	-5.882	-.13782	.12847	-.04293	.01418	-4.12341	.19552	.06127
10.290	-3.899	-.13741	.07527	-.02424	.00722	-4.12222	.19115	.06162
10.290	-1.956	-.13015	.03066	-.00998	.00225	-4.11545	.18846	.05956
10.290	.045	-.13395	-.01737	.00538	-.00288	-4.11599	.18705	.06202
10.290	2.046	-.13259	-.06648	.02948	-.00989	-4.11441	.18747	.06238
10.290	3.946	-.12571	-.11643	.03691	-.01524	-4.11370	.19146	.05775
10.290	5.963	-.12094	-.15946	.05046	-.02014	-4.11090	.19198	.05610
10.290	7.818	-.11129	-.21295	.06883	-.02742	-4.10978	.19906	.05025
GRADIENT		.00106	-.02443	.00767	-.00284	.00079	-.00002	-.00003

TABULATED SOURCE DATA - ARC 3.5 191 (1A18)

(RES005) (21 FEB 75)

1A18 - ARC 3.5 191 - ORBITER + TANK

REFERENCE DATA

XREF = 2000.0000 30. FT. XMRP = 979.0000 IN. XT
 YREF = 1290.3000 IN. YMRP = .0000 IN. YT
 ZREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 17/ 0 RW/L = 2.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CLL
7.320	19.844	-.00259	.28427	-.00221	.12668	-.06184	.00099	-.00029
7.320	20.361	.00036	.39134	-.00068	.11969	-.09626	.00094	-.00058
7.320	21.551	-.00125	.57930	-.00091	.11853	-.17589	-.00011	.00024
7.320	30.711	.00020	.79215	.00192	.12118	-.26865	-.00131	.00001
7.320	35.218	.00194	.98846	.00362	.12363	-.35394	-.00196	.00164
7.320	38.901	.00326	1.13934	.00498	.12632	-.41800	-.00223	.00213
GRADIENT		.00000	.00000	.00000	.00000	.00000	.00000	.00000

(RES006) (21 FEB 75)

1A18 - ARC 3.5 191 - TANK

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

REFERENCE DATA

XREF = 2000.0000 30. FT. XMRP = 979.0000 IN. XT
 YREF = 1290.3000 IN. YMRP = .0000 IN. YT
 ZREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

RUN NO. 0/ 0 RW/L = 3.11 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CLL
5.289	-30.210	-.00330	-.62224	.00323	.17167	.14777	-.00419	.00135
5.289	-24.625	-.00772	-.46556	.00079	.15296	.10440	-.00351	.00079
5.289	-20.401	-.00892	-.39078	-.00170	.13241	.06937	-.00277	.00044
5.289	-14.732	-.01076	-.22533	-.00416	.11140	.03484	-.00221	.00025
5.289	-10.179	-.01060	-.14280	-.00516	.09115	.01840	-.00165	.00019
5.289	-8.192	-.01019	-.11020	-.00476	.08853	.01341	-.00165	.00014
5.289	-6.129	-.01063	-.07929	-.00345	.09871	.01054	-.00147	.00022
5.289	-4.022	-.00997	-.03218	-.00355	.09327	.00860	-.00115	-.00001
5.289	-2.030	-.01177	-.02920	-.00725	.09268	.00781	-.00099	-.00003
5.289	.974	-.01248	-.00412	-.00801	.09285	.00801	-.00086	-.00002
5.289	2.105	-.01150	.00023	-.00791	.09103	.00812	-.00082	-.00004
5.289	4.157	-.01200	.04319	-.00664	.09059	.00769	-.00083	-.00004
5.289	6.164	-.01231	.06737	-.00584	.08977	.00682	-.00018	-.00004
5.289	8.181	-.01306	.09459	-.01558	.08975	.00460	.00027	-.00004
GRADIENT		-.00000	.01168	-.00035	-.00058	-.00007	.00011	-.00000

DATE 08 MAR 75

TABULATED SOURCE DATA - ARC 3.5 191 (IA18)

PAGE 7

(RES006) (21 FEB 75)

REFERENCE DATA

SRP = 2000.0000 SQ. FT. XMRP = 979.0000 IN. XT
 LMRP = 1290.3000 IN. YMRP = .0000 IN. YT
 BRP = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RVL = 3.25 GRADIENT INTERVAL = -5.00/ 5.00

MACR	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CBL
7.320	-30.176	.00242	-.61317	.01698	.17687	.14628	-.00779	.00548
7.320	-24.640	.00229	-.46048	.01169	.15955	.10411	-.00594	.00063
7.320	-20.403	.00056	-.34508	.00888	.13954	.06646	-.00285	.00030
7.320	-14.795	-.00112	-.21520	.00339	.11992	.02733	-.00240	.00018
7.320	-10.326	-.00022	-.13842	.00174	.10436	.01158	-.00105	.00011
7.320	-8.294	-.00120	-.10351	.00055	.10073	.00758	-.00092	.00011
7.320	-6.290	-.00139	-.07865	-.00011	.09777	.00547	-.00067	.00010
7.320	-4.168	-.00016	-.05205	.00053	.09513	.00408	-.00036	.00002
7.320	-2.132	-.00207	-.02782	-.00150	.09410	.00445	-.00029	-.00001
7.320	-.095	-.00338	-.00476	-.00207	.09393	.00614	-.00067	.00000
7.320	1.976	-.00278	.01637	-.00217	.09275	.00765	-.00033	-.00001
7.320	3.973	-.00300	.03718	-.00253	.09314	.00800	-.00023	-.00003
7.320	5.964	-.00164	.06417	-.00120	.09366	.00783	-.00022	-.00001
7.320	7.938	-.00286	.08829	-.00240	.09333	.00743	-.00022	-.00001
GRADIENT		-.00031	.01092	-.00033	-.00026	.00054	.00001	-.00003

RUN NO. 3/ 0 RVL = 1.61 GRADIENT INTERVAL = -5.00/ 5.00

MACR	ALPHA	BETA	CN	CY	C-F	CLM	CYN	CBL
10.289	-23.923	-.00166	-.59459	.01636	.11006	.15360	-.01069	.00180
10.290	-24.389	-.00016	-.44443	.01251	.10535	.11487	-.00687	.00095
10.290	-20.247	-.00254	-.32252	.00231	.11116	.06927	-.00429	.00045
10.290	-14.703	-.00204	-.19082	-.00195	.11000	.02213	-.00134	.00027
10.290	-10.216	-.00033	-.11950	.00060	.09751	.00561	-.00076	.00016
10.290	-8.231	-.00105	-.09041	-.00122	.09771	.00262	-.00037	.00015
10.290	-6.257	-.00175	-.06585	-.00378	.08735	.00048	-.00002	.00013
10.290	-4.139	-.00072	-.03926	-.00205	.08640	.00010	-.00026	.00013
10.290	-2.151	-.00054	-.02521	-.00112	.08663	.00231	-.00003	.00014
10.290	-.196	-.00055	-.00195	-.00103	.08593	.00337	-.00010	.00014
10.290	1.985	-.00118	.01702	-.00280	.08569	.00517	.00011	.00009
10.290	3.920	-.00170	.03462	-.00365	.08531	.00680	-.00002	.00010
10.290	5.920	-.00166	.05414	-.00368	.08551	.00781	-.00002	.00011
10.290	7.871	-.00122	.08296	-.00235	.08741	.00718	-.00018	.00013
GRADIENT		-.00013	.00929	.00025	-.00015	.00116	-.00002	-.00001

IA18 - ARC 3.5 191 - TANK

(MES007) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 SQ. FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = 4.000 RUDDER = .000
 ELEVON = .000

RUN NO. 11/ 0 RV/L = 2.59 GRADIENT INTERVAL = -5.00/ 5.00

WACH	BETA	ALPHA	CN	CY	CAF	CLM	CYN	CBL
7.320	-7.919	4.04599	.04255	.09145	.09330	.00375	.00394	.00015
7.320	-5.949	4.04735	.04321	.06829	.09242	.00619	.00351	.00015
7.320	-3.899	4.04676	.04105	.04236	.09122	.00688	.00258	.00014
7.320	-1.935	4.05308	.04708	.02038	.08934	.00753	.00143	.00013
7.320	.938	4.05211	.04441	-.00177	.09006	.00826	-.00037	.00003
7.320	2.064	4.04963	.04375	-.02405	.09053	.00717	-.00173	.00003
7.320	3.978	4.04977	.04378	-.04644	.09112	.00716	-.00304	.00004
7.320	6.016	4.04824	.04402	-.07242	.09100	.00626	-.00336	.00012
7.320	7.886	4.04778	.04593	-.09754	.09129	.00509	-.00284	.00019
GRADIENT		.00013	.00010	-.01123	.00005	.00001	-.00073	-.00002

RUN NO. 6/ 0 RV/L = 1.52 GRADIENT INTERVAL = -5.00/ 5.00

WACH	BETA	ALPHA	CN	CY	CAF	CLM	CYN	CBL
10.290	-7.970	4.02704	.04215	.08012	.08837	.00520	.00511	.00020
10.290	-5.992	4.02648	.03941	.05095	.08731	.00598	.00453	.00020
10.290	-3.922	4.02751	.04010	.03327	.08501	.00660	.00366	.00012
10.290	-1.940	4.02671	.03822	.01302	.08437	.00675	.00149	.00004
10.290	-.003	4.02722	.03911	-.00680	.08493	.00680	-.00048	.00001
10.290	2.022	4.02717	.03890	-.02714	.08480	.00685	-.00244	.00000
10.290	4.020	4.02882	.04288	-.05084	.08563	.00651	-.00390	.00003
10.290	6.059	4.02676	.04098	-.07213	.08597	.00551	-.00487	.00003
10.290	7.935	4.02647	.04104	-.09403	.08727	.00522	-.00504	.00003
GRADIENT		.00016	.00032	-.01070	.00010	-.00000	-.00096	-.00002

IA18 - ARC 3.5 191 - TANK

(RES008) (21 FEB 75)

REFERENCE DATA

XARP = 2990.0000 90. FT. XARP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YARP = .0000 IN. YT
 XARP = 1290.3000 IN. ZARP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RWL = 3.02 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
5.289	-7.834	-.00276	.10394	.00904	-.00046	.00040	.02401	.09393
5.289	-5.932	-.00361	.07623	.00866	.00095	.00027	.02162	.09413
5.289	-3.913	-.00365	.04828	.00814	.00111	.00016	.01397	.09416
5.289	-1.929	-.00567	.02322	.00856	.00069	.00006	.01835	.09330
5.289	.001	-.00553	.00038	.00853	-.00054	.00002	.01846	.09331
5.289	2.033	-.00462	-.02410	.00834	-.00144	-.00008	.01917	.09215
5.289	3.939	-.00368	-.04641	.00788	-.00160	-.00023	.01910	.09095
5.289	5.999	-.00337	-.07636	.00708	-.00075	-.00028	.01676	.08993
5.289	7.897	-.00488	-.10521	.00665	-.00161	-.00048	.01352	.08869
GRADIENT		.00003	-.01224	-.00004	-.00038	-.00005	-.00005	-.00038

RUN NO. 0/ 0 RWL = 2.18 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
7.320	-7.950	-.00005	.09348	.00605	.00464	.00016	.00969	.09720
7.320	-6.033	.00178	.06966	.00580	.00433	.00007	.01056	.09683
7.320	-3.898	-.00085	.04460	.00562	.00396	.00005	.00831	.09355
7.320	-1.917	-.00034	.02144	.00545	.00224	.00005	.00843	.09318
7.320	.009	-.00029	-.00023	.00644	-.00025	.00008	.01002	.09410
7.320	3.982	.00211	-.04823	.00584	-.00374	-.00014	.01084	.09286
7.320	6.047	.00213	-.07245	.00482	-.00386	-.00026	.00922	.09447
7.320	7.914	.00214	-.09720	.00415	-.00362	-.00032	.00815	.09414
GRADIENT		.00037	-.01177	.00005	-.00099	-.00002	.00035	-.00007

RUN NO. 0/ 0 RWL = 1.51 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
10.290	-8.027	-.00489	.07920	.00434	.00573	.00021	.15226	.09035
10.290	-6.104	-.00156	.06029	.00341	.00524	.00020	.15292	.08890
10.290	-2.090	-.00072	.01531	.00321	.00221	.00004	.15313	.08653
10.290	-.103	-.00267	-.00636	.00297	.00206	.00003	.15187	.08535
10.290	1.908	.00213	-.02569	.00294	-.00239	.00001	.15427	.08497
10.290	3.893	-.00375	-.04866	.00373	-.00436	-.00003	.15113	.08525
10.290	5.950	-.00227	-.07049	.00280	-.00555	-.00003	.15188	.08790
10.290	7.871	-.00631	-.09174	.00314	-.00361	-.00002	.15019	.08816
GRADIENT		-.00051	-.01059	.00008	-.00111	-.00001	-.00018	-.00021

1A18 - ARC 3.5 191 - TANK

(RES009) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 50. FT.
 LREF = 1230.0000 IN.
 BREF = 1290.3000 IN.
 SCALE = .0100

PARAMETRIC DATA

ALPHA = -4.000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RWL = 3.04 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
5.289	-7.870	-.08193	.10413	.01088	-.00143	.00059	-4.05562	.09774
5.289	-5.938	-.05830	.07519	.02960	-.00004	.00041	-4.05440	.09730
5.289	-3.892	-.05462	.04732	.02864	.00026	.00028	-4.05207	.09712
5.289	-1.915	-.05472	.02252	.02913	-.00011	.00018	-4.05074	.09611
5.289	-.001	-.05337	-.00226	.02852	-.00064	.00000	-4.05098	.09504
5.289	2.027	-.05422	-.02630	.02889	-.00152	-.00005	-4.05081	.09449
5.289	3.949	-.05393	-.05071	.02914	-.00181	-.00017	-4.04961	.09380
5.289	6.010	-.05493	-.07934	.02867	-.00298	-.00023	-4.05231	.09323
5.289	7.896	-.05623	-.10848	.02929	.00144	-.00044	-4.05249	.09333
GRADIENT		.00010	-.01248	.00004	-.00028	-.00005	.00025	-.00042

RUN NO. 0/ 0 RWL = 2.75 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
7.320	-7.943	-.05174	.09794	.00996	.00272	.00033	-4.05845	.10025
7.320	-5.934	-.04835	.07187	.00493	.00269	.00021	-4.05668	.09818
7.320	-3.871	-.04864	.04616	.00507	.00193	.00012	-4.05667	.09870
7.320	-1.911	-.04734	.02301	.00386	.00098	.00002	-4.05863	.09705
7.320	-.002	-.04903	.00075	.00383	-.00034	-.00003	-4.06125	.09579
7.320	2.017	-.04804	-.02424	.00368	-.00268	-.00003	-4.06026	.09562
7.320	3.977	-.04658	-.04640	.00391	-.00330	-.00004	-4.05663	.09682
7.320	6.027	-.04602	-.07088	.00374	-.00401	-.00018	-4.05704	.09697
7.320	7.911	-.05133	-.09774	.00463	-.00336	-.00024	-4.06221	.09693
GRADIENT		.00023	-.01184	-.00013	-.00072	-.00002	-.00008	-.00026

RUN NO. 0/ 0 RWL = 1.42 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
10.290	-7.977	-.04794	.08059	.00430	.00311	.00030	-4.05962	.09445
10.290	-6.001	-.04182	.05662	.00223	.00484	.00021	-4.05879	.09288
10.290	-3.898	-.04538	.03574	.00192	.00404	.00020	-4.05093	.09036
10.290	-1.917	-.03987	.01628	.00080	.00238	.00021	-4.05935	.08930
10.290	.033	-.04158	-.00510	.00066	.00066	.00002	-4.05037	.08799
10.290	2.072	-.04237	-.02727	.00084	-.00153	-.00002	-4.05058	.08748
10.290	4.039	-.04098	-.04759	.00069	-.00304	-.00002	-4.05094	.08629
10.290	6.065	-.04389	-.07044	.00194	-.00373	-.00002	-4.05056	.09033
10.290	7.975	-.04097	-.09392	.00227	-.00352	-.00004	-4.05181	.09082
GRADIENT		.00032	-.01058	-.00012	-.00091	-.00003	.00003	-.00035



DATE 08 MAR 75

TABULATED SOURCE DATA - ARC 3.5 191 (1A18)

PAGE 11

1A18 - ARC 3.5 191 - ORBITER + TANK

(YES010) (21 FEB 75)

REFERENCE DATA

SHIP = 2000.0000 50. FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

ALPHA = .000 RUDDER = .000
 ELEVON = .000

PARAMETRIC DATA

RUN NO. 20/ 0 RVL = 2.95 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CAB-O	CAB-T	ALPHA	CN	CY	CA	CLM	CYN	CBL
5.291	-7.749	-.00146	-.00631	-.17752	-.08777	.23219	.05313	.03659	-.09459	.03484
5.291	-5.058	.00040	-.00343	-.17105	-.08831	.16372	.05570	.03977	-.06837	.02492
5.291	-3.834	.00280	-.00207	-.16937	-.08854	.10275	.06386	.04266	-.04626	.01618
5.291	-1.975	.00416	.00103	-.16597	-.08689	.04706	.07035	.04396	-.02651	.00803
5.291	-.059	.00474	.00470	-.16397	-.08354	-.00753	.07966	.04401	-.00826	.00225
5.291	1.938	.00493	.00134	-.16140	-.07789	-.06600	.08942	.04227	.01123	-.00832
5.291	3.794	.00508	-.00092	-.16349	-.07226	-.12039	.10037	.03940	.03037	-.01610
5.291	5.760	.00498	-.00199	-.16602	-.06973	-.18375	.12648	.03413	.05583	-.02562
5.291	7.573	.00496	-.00298	-.17335	-.04604	-.24607	.16233	.02864	.08280	-.03542
	GRADIENT	.00028	.00018	.00085	.00217	-.02918	.00481	-.00043	.00996	-.00422

REFERENCE DATA

SHIP = 2000.0000 50. FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

BETA = .000 RUDDER = .000
 ELEVON = .000

PARAMETRIC DATA

RUN NO. 19/ 0 RVL = 2.65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CAB-O	CAB-T	BETA	CN	CY	CA	CLM	CYN	CBL
5.289	-8.648	-.00417	.00835	-.05962	-.26079	-.04052	.21634	.11055	.01453	-.00556
5.289	-6.416	.00003	.00895	-.05640	-.21198	-.03894	.20558	.09671	.01434	-.00517
5.289	-4.339	.00238	.00955	-.06054	-.17125	-.04033	.19764	.08102	.01395	-.00569
5.289	-2.284	.00370	.00965	-.06080	-.12273	-.03957	.18687	.06363	.01309	-.00584
5.289	-.163	.00428	.00962	-.05717	-.07496	-.03792	.17710	.04713	.01214	-.00568
5.289	1.900	.00453	.00913	-.05426	-.02826	-.03540	.16924	.03164	.01176	-.00573
5.289	3.901	.00476	.00870	-.04960	.01560	-.03313	.16258	.01792	.01151	-.00574
5.289	6.050	.00536	.00822	-.04497	.06441	-.03095	.15617	.00154	.01043	-.00532
5.289	8.092	.00545	.00750	-.04219	.10916	-.02834	.15128	-.01421	.00993	-.00528
5.289	10.220	.00559	.00684	-.04038	.15695	-.02751	.14546	-.03292	.00987	-.00526
5.289	15.498	.00572	.00451	-.03229	.29141	-.03054	.13662	-.08061	.00787	-.00499
5.289	20.818	.00526	.00079	-.03403	.44703	-.02554	.13191	-.13581	.00231	-.00477
5.289	25.509	.00453	.00014	-.03464	.59194	-.03254	.12999	-.18799	.00881	-.00898
5.289	29.320	.00502	-.00167	-.06891	.74804	-.04072	.12839	-.25677	.01082	-.00847
	GRADIENT	.00030	-.00010	.00134	.02222	.00088	-.00417	-.00752	-.00030	-.00000

1A18 - ARC 3.5 191 - ORBITER + TANK

(YES001) (21 FEB 75)

DATE 08 MAR 75

TABULATED SOURCE DATA - ARC 3.5 191 (1A10)

PAGE 12

1A10 - ARC 3.5 191 - TANK

(RES006) (21 FEB 75)

REFERENCE DATA

SAFE = 2090.0000 SQ.FT. YMRP = 979.0000 IN. XT
 XREF = 1290.3000 IN. YMRP = .0000 IN. YT
 ORIF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 26/ 0 RWL = 3.11 GRADIENT INTERVAL = -.5.00/ 5.00

MACH	ALPHA	CAB-T	CN	CY	CA	CLM	CYN	CR
5.289	-30.210	-.00196	-.62224	-.00323	.16971	.14777	-.00419	.00135
5.289	-24.625	.00171	-.46556	.00079	.15468	.10440	-.00361	.00070
5.289	-20.401	.00097	-.35078	-.00170	.13748	.06937	-.00277	.00044
5.289	-14.732	.00710	-.22533	-.00416	.11850	.03484	-.00221	.00025
5.289	-10.179	.00679	-.14280	-.00516	.10794	.01840	-.00165	.00019
5.289	-8.192	.00644	-.11020	-.00476	.10497	.01341	-.00165	.00014
5.289	-6.129	.00578	-.07929	-.00545	.10249	.01054	-.00147	.00002
5.289	-4.022	.00536	-.05218	-.00555	.10063	.00860	-.00115	-.00001
5.289	-2.030	.00624	-.02920	-.00725	.09892	.00781	-.00098	-.00003
5.289	.074	.00560	-.00412	-.00801	.09846	.00801	-.00086	-.00002
5.289	2.185	.00628	.02028	-.00791	.09731	.00812	-.00052	-.00004
5.289	4.157	.00539	.04319	-.00884	.09648	.00769	-.00023	-.00003
5.289	6.164	.00667	.06737	-.00984	.09644	.00682	-.00018	-.00004
5.289	8.162	.00671	.09459	-.01058	.09646	.00460	.00027	-.00004
5.289	GRADIENT	.00010	.01168	-.00035	-.00048	-.00007	.00011	-.00000